THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXX. No. 761.] LONDON, DECEMBER 11, 1877. [29TH YEAR.] Price 6d.

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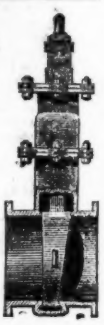

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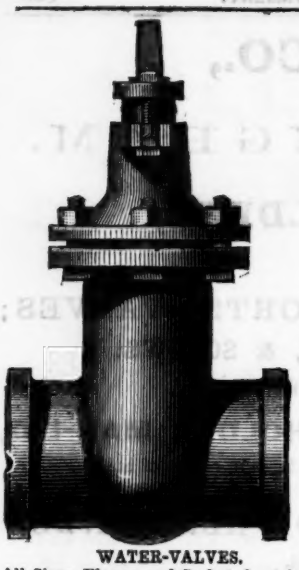

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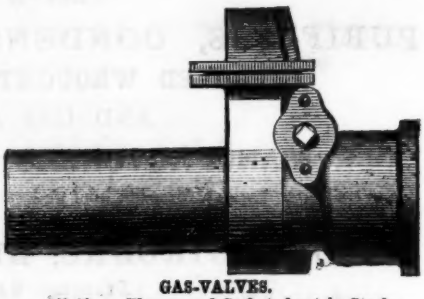

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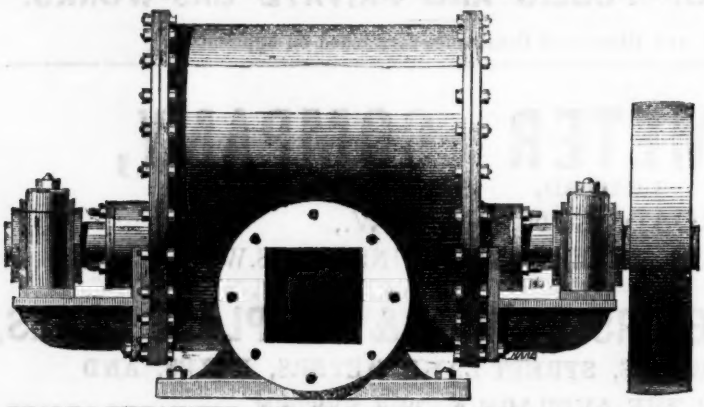

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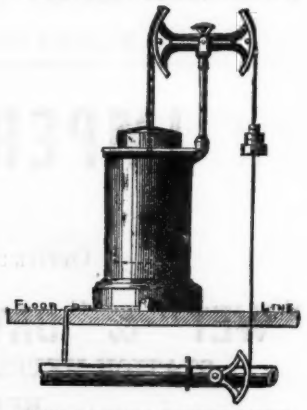

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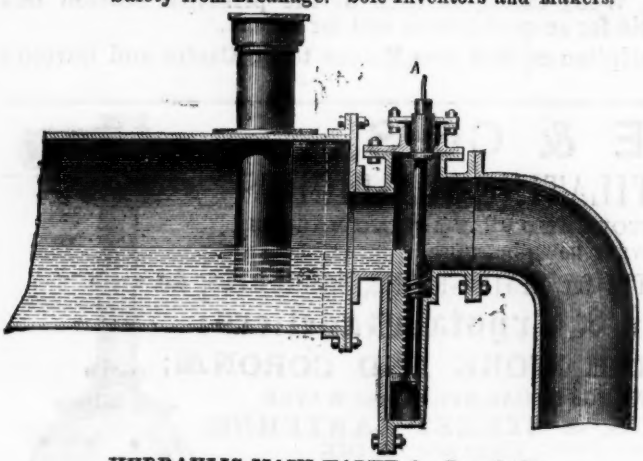

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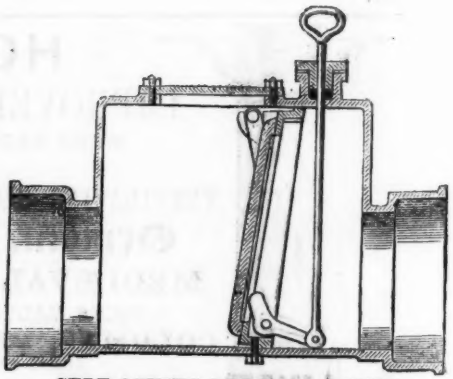

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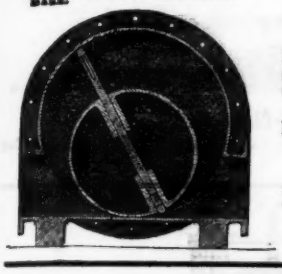

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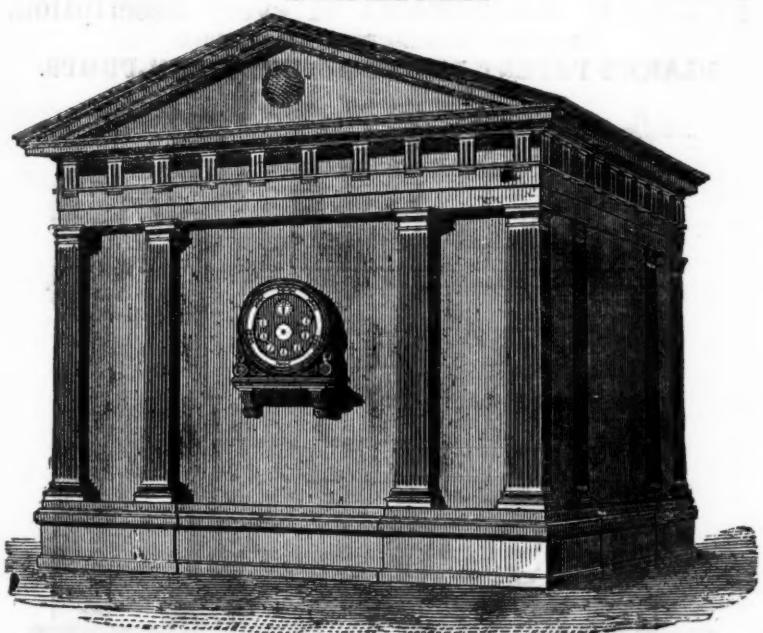

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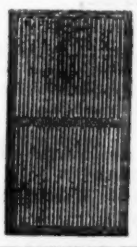

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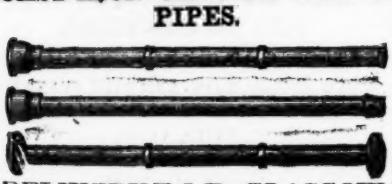

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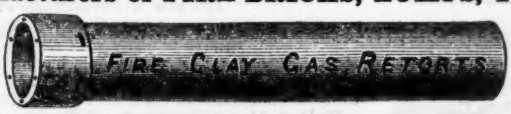
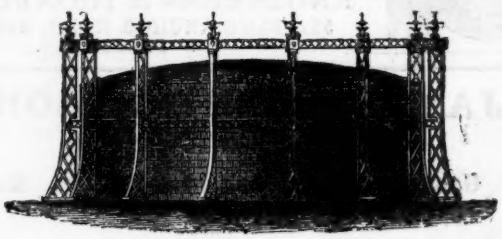
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

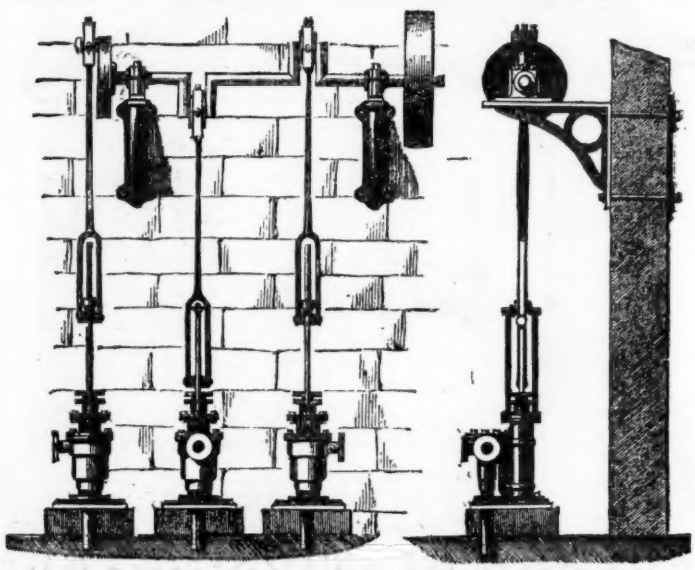


AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,
WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,
Hydraulic Engineers,
AND MANUFACTURERS OF
PUMPING MACHINERY of every Description.
SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF
BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.
For Water. For Tar. For Ammoniacal Liquor.
This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.
These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.
GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.
Illustrated Catalogues sent post free on application.

TANGYE BROTHERS AND HOLMAN,

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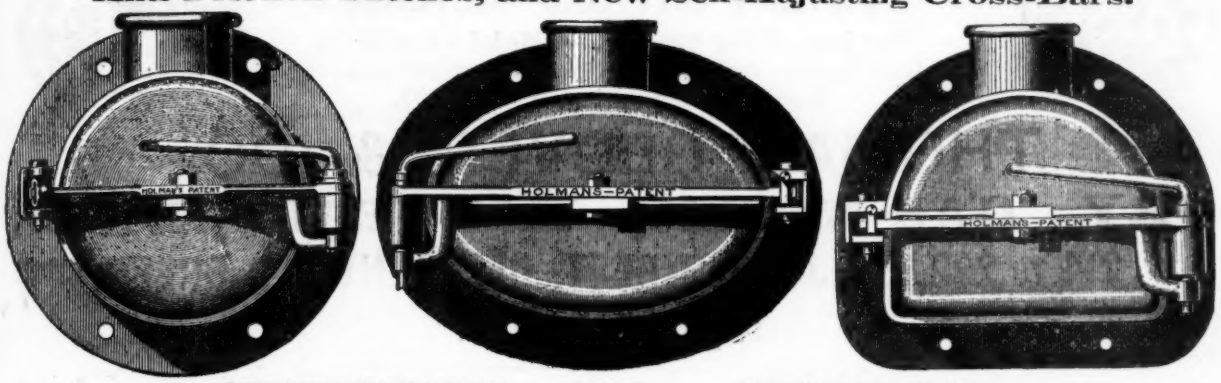
SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), being now in use in nearly all the principal Gas-Works in London and the Provinces.

Messrs. T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT ITSELF (see Illustrations above), instead of, as heretofore, bringing the Mouthpiece from the D or Oval at back to Circular in front.

D and Oval Morton's Lids have now been working satisfactorily for the past two or three years, both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

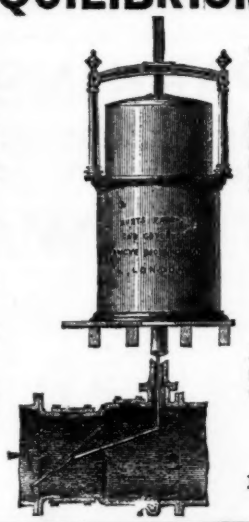
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

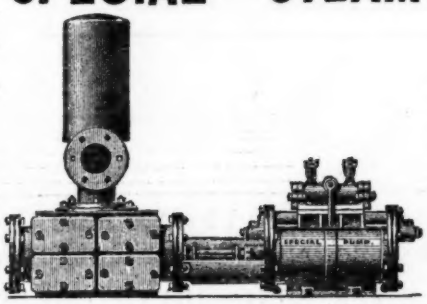
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

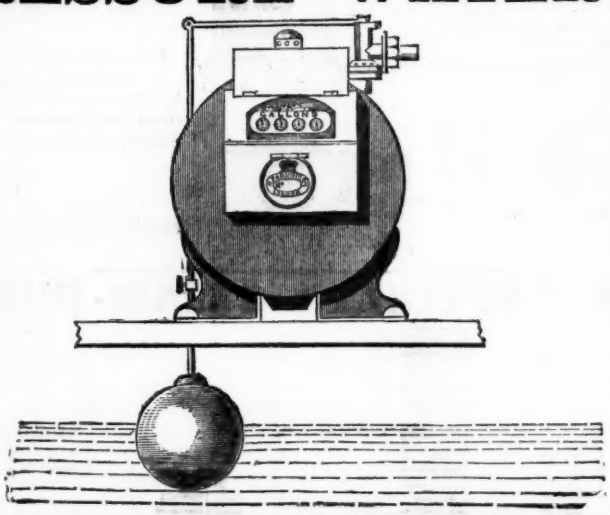
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co. for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 11, 1877.

Circular to Gas Companies.

Although we must regret what may be called the disjointed condition of the Metropolitan Gas Supply, we may express satisfaction that the Companies are to have a year of peace, free from parliamentary interference. It will give time for thought and reflection, and, if wisdom prevail in the councils, we may, in the course of next year, have to report important results. We are assuming that, unless further amalgamations are effected, the session of Parliament after the next, will find more than one Metropolitan Company seeking further powers, and very possibly we may have the Metropolitan Board of Works promoting another Regulations or Purchase Bill. To-day we have three Companies still under the Act of 1860. When either of these go to Parliament they will be brought under the most recent legislation; but, strictly speaking, it is hard to say what that may mean. We have, at the present moment, Companies subject to the sliding scale, but not compelled to sell newly-issued shares by auction; but, in the future, if the new Standing Orders be complied with, they would be subjected to both sliding scale and auction clauses, with the restrictions as regards the sales imposed by the last new Order. It cannot be said that the position of Gas Companies is weakened by the new legislation. There are those intimately concerned in the gas world who think it materially strengthened, and we, who have a preference to "stand on the old ways," shall not dispute with them. We have to make the best of the present, and, therefore, can only counsel the closest union of the Companies. If it be wished to continue the supply of gas to the Metropolis on commercial principles, and to ensure the shareholders the highest price for their property when the inevitable day of purchase comes, no time should be lost in entering into a general combination. Should this be accomplished, we believe that agitation, which is now only dormant, would altogether cease. At present the Metropolitan Board of Works are occupied with a scheme which is certain to prove abortive; but the restless spirit of the more ambitious members will not allow them to remain quiet under the coming defeat. They have made one attack on the Gas Companies, and, supposing the Board still to remain in existence, will, in two or three years, probably make another. Most of the grounds on which they base their arguments would be cut from under their feet by the unity and economy of management which would be ensured by general amalgamation.

What the Board of Trade may propose in the coming session it is impossible to say. The only hint we get is that some measure may be proposed to alter the present mode of testing gas in the Metropolis, which some people affect to believe is unfair to the consumers. In the Metropolitan gas-testing stations the gas is examined, both for illuminating power and purity, by the most perfect apparatus that science has yet devised. If the consumer does not obtain from the gas he burns the same amount of light which is recorded at the testing office, it is his own fault. If he would take the trouble, and go to the expense, of providing such fittings as are used by the Examiners, he would obtain exactly the same amount of light from the gas supplied to him. We admit, however, that this is, in the majority of cases, impossible; but still the complaints made are unreasonable. The measure, as we may call it, used by the Gas Examiner is perfectly just; but if a tradesman buys goods by just measures and weights, and retails them (as he may be said to do, in the case of gas, by the act of combustion with bad burners) with weights and measures that act to his disadvantage, the wholesale dealer is not at all to blame. We regard the present system of gas examination as a perfectly satisfactory one, and doubt whether it is capable of improvement. We might prefer that the Gas Companies should be left alone to do their best for their customers, but this the Legislature will not allow. Under the present system we believe the examination of gas in the Metropolis is honestly conducted, and, although we do not deem it necessary, we have an opinion that it operates favourably for the public. It must be well understood that the Gas Companies interested, while fairly complaining of the expenses imposed upon them, raise no objection to having their gas tested.

The Local Board of Health of Stratford-upon-Avon are desirous of obtaining the undertaking of the Stratford-upon Avon Gas Company. In justification, the members urge all the old fancies and fallacies we have listened to for so many years—that undertakings that had their origin in commercial enterprise ought to belong to the local authorities, and should not be conducted for the profit of those who started them; that the supply of gas and water should be in the hands of a governing body, and used for the public good. Just as though the supply by the Company had not been for the public good. It is curious to note the fact that Local Authorities never dream of purchasing gas undertakings until they have become prosperous, and the agitation for purchase has not unfrequently had its origin in personal jealousies. We do not say that this is the case at Stratford-upon-Avon, where, for aught we know, the best feeling may exist between the Board and the Company. That the town is likely to be better served by the Board than by the Company, no one who knows the result of purchases in other towns is likely to believe. What may be expected, should the Board acquire the undertaking, will be, gas of the same quality at the same price, stricter inspection, and a more rigid collection of rents. We imagine the Company will refuse to sell, and it will not be easy for the Board to effect a compulsory purchase. The Public Health Act very properly protects Gas Companies from indiscriminate confiscation. If the Company decline to sell, the threat is held out that their proceedings shall be narrowly watched. We do not expect that they will object to this, for their business has always been carried out in an open and straightforward manner. They make gas of a good quality, and sell it at a fair price. Their sin is that they make profits, and hence the question that now agitates the Local Board.

Electricity, which is regarded as the enemy of gas, may, it seems, be induced to enter into friendly associations with its rival. The idea of lighting and extinguishing all the gas-lamps in a town simultaneously by means of electricity has often been indulged in, but until recently the object has never been

accomplished. Now, by the ingenuity of Mr. St. George Lane Fox, an apparatus has been devised, which experiments at the Fulham works show to be perfectly successful. The lamp-lighter is evidently a doomed man, but the lamp-cleaner must continue to exist, and hence the saving expected from the new invention may not prove so large as is anticipated. We shall not stay now to give an account of the apparatus, of which we hope to give a full description in an early number; but, taking this invention and its use into consideration, in conjunction with the new water scheme of the Metropolitan Board, we are led to speculate on what will presently be found under the pavements of London streets. A water-pipe on each side of the way, postal telegraph wires in all the leading thoroughfares, and now a lamp-lighting wire down each side of every street, to say nothing of the service-pipes for gas and water. How to deal with this vast congeries of subterranean apparatus will be the question of the future. To-day we need only hazard an opinion that the powers granted by special gas Acts, hitherto passed, do not confer on Companies the right to open the public ways for the purpose of laying down electric wires. Vestries and District Boards can, of course, do as they like with their public footways.

The Eastbourne Local Board have thought better of it, and have come to the conclusion that the present is not an opportune time for purchasing the Gas Company. If they continue to give a full and fair consideration to the matter, they will probably arrive at the decision that an opportune time never will occur, and be content to leave the undertaking in the hands of the Company, who serve them well in every respect.

The necessity for a careful examination of gas-fittings before they are brought into use is well illustrated by a case of suffocation which has recently occurred in Derby. The gas had been laid on but a few days when a man and his wife were found in bed insensible. One survived, the other died. On looking over the fittings, it was found that a nail had been driven into a pipe, making a hole which allowed sufficient gas to escape to cause the catastrophe. We hope the day will soon come when every Gas Company and gas-supplying Corporation will have the power, and rigidly exercise it, of inspecting all internal work before it is brought into use. The carelessness of workmen in these days is, unfortunately, proverbial. One cause of this may possibly be the apathy of masters, who, only intent on making a bill, fail to give the supervision which ought always to be exercised.

Another failure of street lighting by means of petroleum lamps must be recorded. The Local Board of Carshalton, after giving them a few months trial, have gone back to gas, to the satisfaction of every one concerned.

The Directors of the West Hartlepool Gas and Water Company insist on maintaining their present price for gas, and great dissatisfaction is expressed in the town. It seems that serious opposition will be offered to the Bill promoted by the Company, and it is likely that, next year, an attempt will be made to effect a compulsory purchase. A small reduction of price, it appears, would have satisfied the consumers; but, doubtless, the Directors have sufficient reason for refusing the concession.

The North-Eastern Railway Company have hitherto supplied Marske and Saltburn with gas, but are now anxious to dispose of their works, for which they appear to have three competing offers. The Cleveland Gas Company and the Redcar and Coatham Company each offer £8000, and that the Cleveland Company are serious is shown by the fact that they are promoting a Bill to obtain an extension of limits. There has also been formed a local association, under the name of the Marske and Saltburn Gas Company, who seek incorporation, with power to purchase the railway company's gas-works. The notion, however, most favoured at Saltburn seems to be that a Local Board should be formed, to take over the works and supply the district. That Saltburn should not have a Local Board seems remarkable; but, supposing one be formed, we strongly recommend them to leave the gas-works in the hands of a Company, who will do much better for them than they can do for themselves.

Water and Sanitary Notes.

At their weekly meeting last Friday, the Metropolitan Board of Works approved of the two Water Bills which are to be promoted next session. The Purchase Bill was sanctioned almost unanimously, but the Bill to authorize the new scheme encountered a vigorous opposition, and ultimately, the preamble and clauses were carried by very narrow majorities, the Chairman, as usual, voting as a member. That Parliament will sanction the new scheme we do not suppose that even Sir James Hogg believes; and, for our own part, we do not consider that the Purchase Bill has any greater chance of success. In the first place, the Water Companies are strongly represented in the House of Commons; still, we have no doubt that, if English gentlemen thought that the measure would operate beneficially for the Metropolis, they would not hesitate to sink their private interests. But the Bill will probably be opposed on two grounds—first, that the wants of the Metropolis with regard to water are now perfectly satisfied by the Companies; and, secondly, that supposing it was thought desirable to consolidate the supply, the Metropolitan Board are not the body to whom the work could be safely entrusted. One other objection, too, may be raised—the weight of debt that would be thrown on the Metropolis. This latter objection, however, as we have said, we consider insignificant. The strongest reason, in our opinion, is taking the management of the undertakings out of experienced hands, and placing it under the direction of persons utterly inexperienced. There are people who will undertake anything, and some of these, we fancy, are to be found in the Metropolitan Board. A reasonable man might think that, with their own occupations and professions to attend to, the present business of the Metropolitan Board, together with the necessary attendances at Vestry meetings, Vestry committees, and Common Councils, would be quite sufficient for the members, without the addition of the vast amount of work which would be entailed by the management of the London water undertakings. The lives of Vestrymen—at all events some of them—are mysteries which we do not care to penetrate. Confident that they will be saved the labour of conducting the water affairs of the Metropolis, we may congratulate their families and friends on their having more time to attend to their own private concerns.

The Vestries claim their own. That of St. Pancras very wisely instructed their delegates to oppose the scheme of the Metropolitan Board—a command which one of them, at all events, cheerfully, and no doubt conscientiously, obeyed. We are glad to see the Vestries moving in the matter. They have been left too much in the dark, but when they have the schemes placed fairly before them, we have little doubt that an almost unanimous disapproval will be expressed. Until we have the Bill, which is to sanction the new scheme, before us, we can express no opinion on its contents. We gather from one speech, which we print in another column, that the reception of a supply of "potable" water is to be optional. If this be the case, the scheme must necessarily fail, for we may safely assert that it will not be taken in one out of a hundred houses, and those who do not take it will certainly object to pay the rates for those who do indulge in the luxury.

We are glad to see the Corporation of the City of London are taking active steps to obtain further powers for the preservation of open spaces and of common lands within twenty-five miles of the City. If they would only set seriously to work in the preparation of a scheme for a municipal constitution of the whole metropolitan area, they would deserve the thanks of all posterity. By devoting Corporation funds to the preservation of Epping Forest, where Lord Mayors and Aldermen no longer chase the stag on Easter Monday, they have admitted the principle that those funds are the common property of the whole Metropolis. They may as well go a step further, and, before violent hands are laid on them, spontaneously join in the government of all London.

How not to do it? is a question that has recently engaged the attention of the Town Council of Walsall, a borough with a sewage difficulty. The difficulty, however, does not lie in engineering works, nor in the cost of them; it simply arises from an indisposition of a majority of the council to have the work done at all, if they can possibly avoid it. Thus every excuse is made for delay. It took the Town Council, with the threats of legal proceedings constantly before them, more than a year to decide between a sewage farm and treatment by precipitation; and now, having apparently decided upon precipitation, they hesitate and wait, in the hope that in the course of the next twelvemonths something better will turn up. On such excuses they may wait for many a long year, if their neighbours will allow them. Walsall was left out of the United Drainage Scheme because the Corporation had promised, and were supposed to have under consideration a definite plan, which it was intended to carry out at once. Yet nothing has been done, and we expect shortly to hear of proceedings under the Public Health Act, which may result in the execution of the works by the Central Authority. Most certainly, when Birmingham is purifying its sewage, Walsall will not be allowed to continue to pollute the stream.

We have so often asserted that the registration of disease is of far more importance than the registration of deaths, that we see with great satisfaction that, by a clause to be introduced into a

Police Bill about to be promoted by the Edinburgh Town Council, it is proposed to make the registration of every case of communicable disease compulsory. Two things have hitherto stood in the way of accomplishing this desirable object. The Doctor wants his fee for sending his certificate, and respectable families are always desirous to conceal the fact that they have a communicable disease in the house. The Edinburgh Authority propose to satisfy the Doctor by supplying him printed forms and stamps, and giving him half-a-crown for every certificate. What is to be done when the certificate is given we are not yet told. Complete isolation is the one preventive for the spread of communicable disease. How are the Edinburgh Police to ensure this?

The force of centralization can no further go. The Birmingham Guardians, with kindly hearts, were desirous of giving occasionally to the children under their care a currant instead of a suet pudding, and in order to do so without danger of a surcharge, the Guardians were compelled to ask the permission of the Local Government Board. After what we may suppose was a long and anxious consideration, permission has been granted, and so generous are the Central Authority, that they suggest the addition of a little sugar to make the pudding more palatable! Are not these the days of what Mr. Lowe calls "grand-motherly Government?"

If ever the new water scheme proposed by the Metropolitan Board of Works should be seriously entertained, attention will, no doubt, be drawn to the system of using tube-wells, so ably described by Mr. Sutcliff at a recent meeting of the Society of Engineers. The system of coupling a number of tube-wells by means of a main, so that one engine may pump from the whole number, has been in operation several years at Messrs. Allsopp and Sons' Brewery, Burton-on-Trent, where 600,000 gallons of water a day are drawn from thirty, three-inch, tubes. The system is also in use in several towns, and from its great economy will, doubtless, soon be employed in many more.

There can be no doubt that dirty water-cisterns largely assist in the spread of disease, always supposing water to have anything to do with its distribution; but we cannot believe in the alarming statement made by a correspondent to *The Times* that, when a family go from town in the autumn, and leave a single servant to take care of the house, sufficient iniquities accumulate in the cistern to produce attacks of typhoid fever in the members of the family as soon as they return. We strongly advocate the cleansing of cisterns at short intervals; but we very well know that the practice is not followed out. As a rule, the cisterns of London houses remain uncleansed for a number of years, and nobody knows that any harm results. The water in a cistern, well protected from atmospheric contaminations, is not at all likely to produce disease. It is needless to say that we regard the atmosphere as the great purveyor of what, by a figure of speech, may be called preventible diseases.

We are glad to see the opposition to the Thirlmere scheme diminish in intensity. The opponents seem to concede that Manchester have a right, if they can obtain the sanction of Parliament, to take a supply of pure and wholesome water from whatever source they may select. It is confessed that the opposition is based on purely sentimental grounds, of which we fancy but little notice will be taken. The wants of large populations, like those of Manchester, Oldham, and Wigan, deserve infinitely more consideration than the sentimental whims of the relatively few tourists who every autumn wander and gape through the Lake district. Strong objections are now raised to the ornamentation of the embankment which has been proposed by the Corporation of Manchester. From one point of view we fall in with the objection. We have a great admiration of engineering works, pure and simple. It may be want of taste, but we do not remember an instance in which we have seen them seriously interfere with the beauty of the surrounding scenery. The sentimentalists of past years would probably have objected to the opening of coal mines in districts which two hundred years ago contained some of the loveliest scenery in England. But necessity has no law. We must have coal, and hence black desolation where green exuberance once existed. Manchester must have water, but in this case we do not believe that any desecration of natural beauties will result. Thirlmere will not be a whit less lovely amid its surroundings than it is to-day. The idea that at times a wide expanse of dry shore or stinking mud will be exhibited is somewhat absurd. It could only occur after a drought such as is unknown in the Lake regions. It is said that an attempt will be made to reject the Bill of the Manchester Corporation, on a second reading, without sending it to a committee. We cannot believe it will be successful. Those who want the water will insist that the scheme shall be examined in all its bearings; and Parliament, we feel certain, will not lightly reject a measure certain to prove beneficial to large populations.

We fear that all attempts to make the air of large manufacturing towns as clean and pure as that of the northern moors will prove more or less ineffectual. Sulphuric acid must, of necessity, be thrown into the atmosphere; but smoke and soot may be, to a great extent, prevented. We have, at the present day, schools for all sorts of people; cannot we have one for stokers? Smoke is caused by bad stoking. Heaps of coals are shovelled into a furnace, much of which, but not so much as some people think, goes up the chimney-shaft in the shape of soot. After overloading his furnace, the stoker sits down and smokes his pipe until he thinks another load of coal is required. A furnace carefully and lightly fed evolves little smoke, but, perhaps, produces more sulphuric acid. We recommend these points to the consideration of the deputation who recently waited on the Mayors of Manchester and Salford, and entreated them to put in force all the powers they possess to suppress the smoke nuisance. As regards noxious vapours from chemical factories, it must be admitted that the escape of these is easily preventible, and that their suppression may be reasonably insisted upon. In the aggregate, perhaps, as much smoke escapes from the chimneys of private houses as from the shafts of factories, and with this source of nuisance it is impossible to deal. The wasteful consumption of coal must, we fear, continue, the main cause being the cheapness of the material. When coal is exhausted, England may once more become a garden; but where will the population be? Before, however they disappear, trials may be made of various forms of heating apparatus, by the use of which smoke may be entirely prevented. There are, as was said in Manchester the other day, furnaces, in which three pounds of coal would do the work of twelve pounds, half consumed in another, and a room in a cottage may be effectually warmed by a small stove, fed now and then by a few ounces of gas coke.

LIGHTING BY ELECTRICITY.

(*Continued from page* 868.)

We have now arrived at that point at which a description of the electric lamp and its regulator will be in place. Fig. 5, which must be considered more as a diagram of the machine than a representation of the highly-finished apparatus itself, shows the carbons in the holders and in contact—the position they always take when the current is not passing, whether from accident or otherwise. For the better understanding of the routine of the mechanism of this kind of regulator, let us suppose that we raise by hand the upper carbon holder half an inch. This will cause the lower carbon, in consequence of the proportion that the rack-wheels bear to each other in this case, to descend a quarter of an inch, and create a breach equal to three-quarters of an inch—an exaggerated distance, of course—no such remoteness being required in practice. During this hand-produced movement the large wheel revolves from right to left, causing the ratchet to revolve in the opposite direction. But, as this ratchet turns freely on the arbor of the wheel, R, the fly, W, is not necessarily put in motion, the teeth of the ratchet running back under the click, *t*. Now, if the hand be removed, we shall see to an exaggerated extent what takes place when the current is, from any cause, interrupted. The upper holder, in consequence of its weight, and through the medium of its rack, immediately becomes a motor, and puts all the train of wheels in motion, including the fly, W, the function of which is to prevent the carbons coming together too quickly, it being important that, when hot, their contact should be easy, to save chipping of their ends.

It has already been stated, in connection with the early experiments in electric lighting, that if the light was lost from any cause whatever, the carbons had to be again brought in contact in order to reproduce it, and then readjusted as regards distance, for its full development. But, according to this automatic arrangement, the carbons have a constant tendency to come together; consequently, a counteracting influence has to be provided. This object, as we shall see, is cleverly accomplished by the train of wheels and the *electric current* as motor. In order to get a comprehensive view of this ingenious provision, we will suppose that the current has been suspended for a short time in order to remedy some defect in the machine that generates it. The tendency of the carbons to run together without some counteracting influence at once comes clearly into play, because the current that held the movement of the regulator against the gravitating tendency of the upper carbon is now non-existent; consequently, the points that are a quarter of an inch or more asunder begin to approach each other at the rate allowed by the fly, W, until in contact, as shown in fig. 5. The carbons remaining in the position in which they are here shown, and the current re-established, taking the route indicated by arrows, it will not only be flowing through the carbons with full force, but through the electro-magnet also, and the armature, A, pivoted at B, is immediately drawn to the poles thereof. By this action the arm, A^1, is thrown to the left. At the moment this movement commences, the pawl, *s*, being removed from the pin, *n*, which is not in the wheel, as it appears to be, but a fixture, engages immediately with the ratchet-tooth nearest its end, and oscillating with the arm, puts the ratchet-wheel back under the click,

Fig. 6.

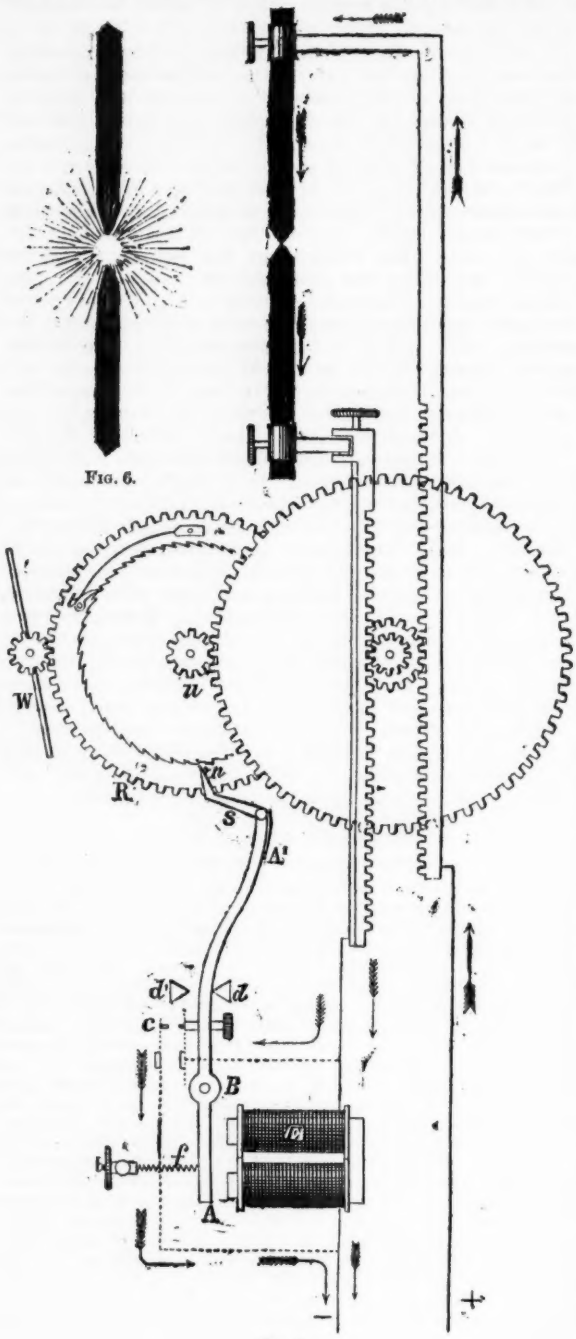


Fig. 5.

t, a fraction of a revolution, the arm, A^1, resting for a moment against the stop, d^1. This vibration having backed the ratchet-wheel, *u*, it is manifest that the large wheel, being in gear with the ratchet-wheel pinion, must also have moved from *right* to *left*; and such being the case, it is clear that the top carbon has been raised, and the lower one let down, by which the distance between them has been increased.

During the moment of time that the arm, A^1, is resting against the stop, d^1, the screw in the arm was in contact at *c*, consequently the current being shunted takes the direction shown by the dotted line, and the electro-magnet is for a moment demagnetized, and its armature left to the influence of the spring, *f*, alone, the tension of which causes the armature to move towards it. This movement of the armature to the left takes the arm, A^1, from the stop, d^1, to the stop, *d*, and the pawl, *s*, to the pin, *n*. The contact at *c* is by this movement again broken, and the current re-established in the coils of the magnet, E; the armature is once more withdrawn from the power of the spring; the arm going back to the stop, d^1, makes contact at *c*, and again causes the demagnetizing of the magnet. This operation is repeated until the carbons are at the best light-giving distance apart, which is ascertained by observation; and the adjustment of the tension of the spring, *f*, by the screw, *b*, maintains this condition.

Let us now suppose that the distancing function of the wheel-work has produced the maximum of light by the separation of the carbons, as shown in fig. 6, which are thus every moment getting shorter. If the current were to remain of the same power, which is not always the case, this shortening of the carbons would require them to be every moment approaching each other at the wearing rate; but as this is impossible, to be on the safe side the gravitating tendency of the upper carbon holder is allowed freedom of action, the pawl, *s*, being out of gear in consequence of it resting against the pin, *n*. Now, if the rate at which the carbons tended to meet could be made equivalent to the rate of consumption, all that is required in this direction might be accomplished by the weight of the upper carbon holder and the fly, W; but this being out of the question, in order to keep the distance from increasing, in consequence of the wearing away of the ends, to an extent that would break the current, the tendency to approach is allowed to be in excess of the wear; consequently, in a very short period of time the space between the points becomes diminished, and the force of the current thereby increased. This increase of force in the current augments the power of the electro-magnet, which, in spite of the spring, *f*, attracts the armature to its poles, causing the arm, A^1, to vibrate to the left and make contact at *c*. The currrent is thus shunted for a moment, and the electro-magnet is demagnetized, and during this interval the spring, *f*, takes effect, and sends the arm to the right, so that the pawl, *s*, may take over another group of ratchet teeth. The power of the magnet being again established by this movement, and the armature drawn to its poles, the arm, A^1, vibrates now to the left, and, by means of the pawl, *s*, the ratchet-wheel is backed in the same proportion as the circumference bears to the number of teeth taken over by the pawl, *s*, and so on, until the distance between the carbons is such that the power induced in the magnet, by the flow of the current through it, is not greater than the tension of the spring, *f*, yet strong enough to produce the amount of light required between the points or ends of the carbons. This state of things, of course, lasts but for a very short period, in consequence of the constant wasting of the electrodes, therefore this automatic adjustment is in constant requisition. The want of homogeneity in the carbons is a source of much irregularity; pieces sometimes fly off and cause a great diminution of light, until the regulator readjusts the distance. In fact, under the best possible conditions known, the light fluctuates very much; and although the automatic arrangements act very promptly when required—and that is almost continually—the change of light-power is very observable. And it cannot be otherwise, for the effect of the wasting of the carbons and the variation in the intensity of the current must be, to some extent, existent before the mechanical remedy is brought into operation, after which there must be time for the round of action, brought into play by the necessity, to complete the work of adjustment.

A great mistake is frequently made with regard to the electric lamp and the lighting thereby. Many people think that the voltaic battery having been superseded by what may be called electric current-induction machines, any required amount of electricity can be obtained, and brought to bear at any point, as easily as the machines can be made to revolve by steam-power at the rate of 800 or 1000 revolutions per minute, for the purpose of inducing the said amount of electric force; and that the parts composing the dynamo-electric machines are as equal to, and as constant and perfect in their action as the different parts of the steam-engines that drive them. The tables appended will show better than any statement that can be made in any other form, that that is not the case, and that there is yet much to be done with regard to this matter.

With a view to the extension of electric lighting to lighthouses, the Trinity House, early this year, instituted a trial at the South Foreland of dynamo-electric machines. Two celebrated makers, Gramme and Siemens, each sent two machines; and in Mr. Douglass's report on the merits of these machines, Gramme's are referred to as Right hand and Left hand; while Siemens's are noted as No. 58 and No. 68. The experiments commenced on the night of the 26th and 27th of January last, and, as near as circumstances would allow, the lighting began at sunset, and continued till sunrise every night during the whole time the trial lasted, which was up to the 7th of April. The reports of the engineer in charge are given in the Appendix, which is reprinted on pp. 909 to 912.

In these tables attention is very often called to the imperfect action of the commutators of the machines under trial. It will not, therefore, now be out of place to remark that a commutator should be to the dynamo-electric machine what the slide-valve is to the steam-engine. The functions of the latter are the changing and directing of the steam "current;" and it is, therefore, in this sense, as much a commutator as the appliance for changing and directing the electric current from the producer to its required place. Now, if the slide-valve were not already in existence, but a leaky prototype, a great amount of the steam generated at the expense of the fuel, instead of being directed alternately to either end of the cylinder for actuating the piston, would escape at once through the exhaust port into the atmosphere, proving that, however well ordered in other respects the engine might be, a very important part had yet to be supplied to make it an efficient motor. This is the condition of the dynamo-electric machine at the present time. Flashing at the commutators is force that has been generated at the expense of steam power escaping unused; and the burning and rapid wear of commutator brushes and plates is the bringing about of a condition of overhauling and repair, often only a small amount of work, that nothing but skilled attendance can supply. This, of course, is easily enough obtained at a lighthouse on land, and such a light is worth the attention and necessary gear for its accomplishment; but the supposition that such machinery is applicable for general lighting is as unreasonable as to suppose that we should ever have attempted to cross the ocean by steam, if some part of the engines required, every day or two, to be in a lathe for truing up, or for any other purpose of that sort.

(*To be continued.*)

SOUTH FORELAND.

TRIAL OF "GRAMME" AND "SIEMENS" MACHINES.

Machine.	Date. — 1877.	Time of Lighting. P.M.	Time of Extinguishing. A.M.	How long Worked. Hrs. Min.	Coke Consumed. Cwt. qrs.	Temperature of Engine-Room. — Degrees Fahr. Sunset.	Midnight.	Sunrise.	Temperature of Coils of Machines. — Degrees Fahr. Sunset.	Sunrise.	Carbons Consumed. ½-in.	⅝-in.	Revolutions of Machines.	Remarks.
GRAMME, Right hand.	Jan. 26	4.37							56	74	Ft. In. 3 10	Ft. In. 3 4	450	A good light maintained all night. Everything worked satisfactorily.
SIEMENS, No. 58.	„ 27	—	7.48	15 11	16 0	55	—	56	70	78	4 2	2 8	850	A good light maintained all night. Everything worked satisfactorily.
GRAMME, Right hand.	Jan. 27	4.39							—	76	3 11	3 8	450	Found it necessary to stop Gramme machine this morning at 4.12, to adjust one of the commutator brushes, to keep it from flashing. Low light out four minutes.
SIEMENS, No. 58.	„ 28	—	7.47	15 8	15 0 Non-condensing.	56	—	—	—	86	3 4	2 5	850	The Siemens machine worked all night. The commutator and brushes kept in good order.
GRAMME, Right hand.	Jan. 28	4.40							—	63	4 6	3 0	442	A good light was maintained all night. Everything worked satisfactorily. The only difficulty is to keep the low light in focus, the ⅛-inch carbons burning too quick.
SIEMENS, No. 58.	„ 29	—	7.45	15 5	13 2	—	52	50	—	69	3 8	2 6	840	A good light was maintained all night. Everything worked satisfactorily.
GRAMME, Right hand.	Jan. 29	4.22							—	72	4 1	3 6	454	The Gramme machine ran well all night. The current flashed at the commutators, frequently caused by a piece coming off. The commutators require to be trued up on the surface.
SIEMENS, No. 58.	„ 30	—	7.44	15 22	17 0	—	—	62	—	—	3 10	2 11	849	The Siemens machine ran well all night. Bearings kept cool. Commutators in fair order.
GRAMME, Right hand.	Jan. 30	4.44							—	72	4 0	3 4	446	A good light was maintained all night, but not so steady as on previous nights, owing to the commutator being in bad order.
SIEMENS, No. 58.	„ 31	—	7.42	14 58	13 2	—	—	54	—	74	3 7	3 5	836	The commutator was getting badly cut. Took off this morning, trued up, and repaired the brushes.
GRAMME, Right hand.	Jan. 31	4.46							—	69	3 0	3 8	440	Machine worked satisfactorily all night. A good steady light was maintained. The commutator did not flash as much as on previous nights.
SIEMENS. No. 58.	Feb. 1	—	7.41	14 55	17 2	—	—	60	—	74	3 5	3 6	840	Machine worked well. A good light maintained all night.
GRAMME, Right hand.	Feb. 1	4.48							58	78	3 10	3 5	Midnt 454 Sunrise 442	Gramme machine ran well all night, and a good light was maintained.
SIEMENS, No. 58.	„ 2	—	7.39	14 51	15 0	58	60	60	58	88 at 6.30	3 10	3 5	Midnt 863 Sunrise not taken.	Had to take off Siemens No. 58 machine this morning at 6.30. Brushes burned out and machine coils of high temperature, caused by the current not leaving the machine properly.
GRAMME, Right hand.	Feb. 2	4.50							62	74	5 6	—	458	Gramme machine worked well till 3.40, when it started flashing at the left hand commutator. The brush was burned up to the holder, caused by a small piece coming out of the commutator.
SIEMENS, No. 58.	„ 3	—	7.38	14 48	17 0	62	63	63	62	92	7 1	—	860	Siemens No. 58 machine did not work satisfactorily. Could not keep the brushes from burning, which caused it to work at a high temperature. Commutator plates in bad order, and will not stand truing up.
GRAMME, Right hand,	Feb. 3	4.51							57	59 at 6 p.m.	1 0	—	443	Had to stop Gramme machine at 6 p.m. on the night of the 3rd, on account of the commutator and brushes of Siemens No. 58 being in bad order and burning.
SIEMENS, No. 58.	„ 4	—	—	1 9	14 2	57	59	54	57	95 at 6 p.m.	0 10	—	845	Siemens No. 58 machine had to be stopped at 6 p.m. on the night of the 3rd, on account of commutator and brushes burning and coils of machine at high temperature. After smoothing commutator and brushes, again started at 9 p.m., but could only work it for 15 minutes.
GRAMME, Right hand.	Feb. 5	8.0							60	76 at 2 a.m.	2 8	—	450	Started at 8 p.m.; machine worked satisfactorily and a good light was maintained. Had to stop at 2 a.m., on account of the brushes of Siemens No. 58 being burned out.
SIEMENS, No. 58.	„ 6	—	2.0	6 0	5 0	60	62	63	60	76	3 0	—	860	Took the commutator plates off No. 58 machine and fitted the plates of the other machine to it, and started it at 8 p.m. Had to stop it at 2 a.m. Brushes burned out. From 9 till time of stopping the temperature of coils kept steady at 76°.
SIEMENS, No. 68.	Mar. 6	5.47							74	76	5 6	—	820	Machine worked well, but flashed frequently at the commutator. A good light was maintained all night, the carbons burning satisfactorily at ¼-inch apart.
SIEMENS, No. 58.	„ 7	—	6.34	12 47	10 0	62	64	65	74	76	4 8	—	865	Machine worked well, but flashed frequently at the commutator. The carbons could not be burned the proper distance apart, or the light went out.
GRAMME, Left hand.	Mar. 7	5.49							53	76	5 2	—	Could not be taken.	Machine worked well, and a good light maintained. Bearings of machine kept quite cool. Commutators and brushes in fair order. Could not take the revolutions on account of machine being too near to engine-bed.
SIEMENS, No. 68.	„ 8	—	6.32	12 43	10 0	53	55	56	53	90	5 0	—	865	Siemens No. 68 worked well, and a good steady light was kept all night. The carbon points burned satisfactorily at ¼-inch apart. Machine bearings, commutator, plates, brushes, &c., kept in good order.

SOUTH FORELAND.—TRIAL OF "GRAMME" AND "SIEMENS" MACHINES (*continued*).

Machine.	Date. — 1877.	Time of Lighting.	Time of Extinguishing.	How long Worked.	Coke Consumed.	Temperature of Engine-Room. — Degrees Fahr.			Temperature of Coils of Machines. — Degrees Fahr.		Carbons Consumed.		Revolutions of Machines.	Remarks.
		P.M.	A.M.	Hrs. Min.	Cwt. qrs.	Sunset.	Midnight.	Sunrise.	Sunset.	Sunrise.	½-in.	⅝-in.		
GRAMME, Left hand.	Mar. 8	5.51	6.30	12 39	12 2	52	55	56	52	78	Ft. In. 6 0	Ft. In. —	Could not be taken.	Machine worked well, and a good steady light was maintained. Flashes occurred frequently at the right-hand commutator, found it necessary to set forward these brushes a little every morning.
SIEMENS. No. 68.	„ 9	—							52	88	4 9	—	851	Siemens No. 68 machine worked well. No flashing at the commutator of any consequence occurred. Commutator plates and brushes taken off every morning, and washed in turps, to clean them.
GRAMME, Left hand.	Mar. 9	5.53	6.28	12 35	10 0	51	54	56	51	80	6 1	—	Could not be taken.	Machine worked well and a good light was maintained. Flashing occurred frequently at the right-hand commutator.
SIEMENS, No. 68.	„ 10	—							51	86	4 7	—	846	Siemens No. 68 machine worked satisfactorily. Commutator, brushes, &c., in good order.
GRAMME, Left hand.	Mar. 10	5.54	6.25	12 31	13 0	51	56	57	51	70	5 5	—	Could not be taken.	Gramme left-hand machine flashed at the right-hand commutator; it is getting very rough and in bad order, and brushes burning away very quick. A good steady light was kept all night.
SIEMENS, No. 68.	„ 11	—							51	76	5 4	—	840	Siemens No. 68 worked well, and a good light was maintained. Took off the commutator plates and brushes; trued up the plates in the lathe and set forward the brushes.
GRAMME, Left hand.	Mar. 11	5.56	6.23	12 27	12 0	52	54	58	52	73	5 7	—	Could not be taken.	Gramme left-hand machine worked well and did not flash at right-hand commutator so much as on previous nights. A good steady light was maintained during the whole night.
SIEMENS. No. 68.	„ 12	—							52	76	5 3	—	844	Siemens No. 68 machine worked well. Commutator, brushes, &c., in fair order.
GRAMME, Left hand.	Mar. 12	5.58	6.21	12 23	13 0	51	58	60	51	70	6 4	—	Could not be taken.	Gramme left-hand machine worked well, and a good light was maintained, but it flashed frequently at the top brush of right-hand commutator.
SIEMENS, No. 68.	„ 13	—							51	74	5 0	—	865	Siemens No. 68 machine worked well, and a good steady light was maintained all night. No flashing occurred at the commutator only when a change of lamps took place. Have renewed the top brush on the left-hand side of commutator.
GRAMME, Left hand.	Mar. 13	5.59	6.19	12 20	11 2	54	56	59	54	70	5 9	—	Could not be taken.	Gramme left-hand machine worked well, and a good light was maintained; but it flashed frequently at the right-hand commutator.
SIEMENS, No. 68.	„ 14	—							54	81	5 0	—	862	Siemens No. 68 machine worked well, and a good light was kept during the whole night. Commutators and brushes in good order.
GRAMME, Left hand.	Mar. 14	6.1	6.16	12 15	12 0	55	64	58	55	74	6 0	—	Could not be taken.	Gramme left-hand machine worked well, and a good light was kept all night. Bearings and brushes in good order, but the commutator very rough.
SIEMENS, No. 68.	„ 15	—							55	76	4 9	—	856	Siemens No. 68 did not work so well last night; it flashed frequently at the commutator, more especially when a change of lamps took place.
GRAMME, Left hand.	Mar. 15	6.3	6.14	12 11	10 0	55	60	62	55	78	5 10	—	Could not be taken.	Gramme left-hand machine worked very unsatisfactorily. Could not keep it from flashing at the right-hand commutator, but a very good light was kept all night.
SIEMENS, No. 68.	„ 16	—							55	82	4 10	—	870	Siemens No. 68 machine worked well; no flashing took place at the commutator but when the lamps were changed. *Last night's run is the most successful this machine has made.*
GRAMME, Left hand.	Mar. 16	6.4	6.12	12 8	12 0	55	57	56	55	74	6 2	—	Could not be taken.	Gramme left-hand machine flashed frequently at the commutator. The top brush on the right-hand side is getting very short, and does not work satisfactorily.
SIEMENS, No. 68.	„ 17	—							55	78	5 2	—	843	Siemens No. 68 machine worked well, and a good steady light was kept all night. No flashing of any importance took place only when the lamps were changed.
GRAMME, Left hand.	Mar. 17	6.6	6.9	12 3	12 2	51	53	56	51	73 At 2.30 A.M.	5 10	—	Could not be taken.	At 1.40 a.m. the light was out 5 minutes, owing to the under brush on the right-hand commutator getting loose. At 2.15 a.m. had to start Gramme right-hand machine; the left one flashed so badly at the commutator, it will be difficult to get it to run a whole night.
SIEMENS, No. 68.	„ 18	—							51	80	4 9	—	847	Siemens No. 68 machine worked very satisfactorily, and a good steady light was kept all night. No flashing at the commutator occurred only when the lamps were changed.
GRAMME, Left hand.	Mar. 18	6.8	6.7	11 59	12 2	56	60	60	56	74 At 8.40 P.M.	5 1	—	Could not be taken.	Gramme left-hand machine had to be stopped at 8.40 p.m. It flashed at both commutators so badly that there was danger of injuring coils of machine. The right-hand one did not run satisfactorily, the commutators being so rough. Two of the brushes are getting too short for use.
SIEMENS, No. 68.	„ 19	—							56	80	5 2	—	842	Siemens No. 68 machine worked very satisfactorily, and a good light was kept all night. Renewed the brushes and commutator plates this morning.
GRAMME, Right hand.	Mar. 19	6.10	6.5	11 55	14 0	58	58	59	58	70	5 7	—	430	Had to work Gramme right-hand machine all night. A light could not be got from the left-hand one. Made another trial with it to-day in the engine-room, but have not been successful; could not even get a spark. The right-hand one did not work satisfactorily. There is a continual burning of the brushes.
SIEMENS, No. 68.	„ 20	—							58	76	5 0	—	870	Siemens No. 68 machine worked very satisfactorily, and a good light was kept all night. The commutator plates and brushes in good order.

SOUTH FORELAND.—TRIAL OF "GRAMME" AND "SIEMENS" MACHINES (*continued*).

Machine.	Date. — 1877.	Time of Lighting.	Time of Extinguishing.	How long Worked.	Coke Consumed.	Temperature of Engine-Room. — Degrees Fahr.			Temperature of Coils of Machines. — Degrees Fahr.		Carbons Consumed.		Revolutions of Machines.	Remarks.
		P.M.	A.M.	Hrs. Min.	Cwt. qrs.	Sunset.	Midnight.	Sunrise.	Sunset.	Sunrise.	½-in.	⅜-in.		
											Ft. In.	Ft. In.		
GRAMME, Right hand.	Mar. 20	6.11	6.3	11 52	13 2	53	57	59	53	72	5 5	—	452	Gramme right-hand machine worked very unsatisfactorily. Red burning sparks appeared frequently at the commutators all night.
SIEMENS, No. 68.	„ 21	—							53	84	4 8	—	859	Siemens No. 68 machine worked satisfactorily; very little flashing took place only when the lamps were changed.
GRAMME, Right hand.	Mar. 21	6.13	6.0	11 47	13 2	51	58	56	51	65	5 5	—	451	Gramme right-hand machine did not flash at the commutator so badly as on previous nights. A good light was kept all night. Have put in one of the new brushes this morning.
SIEMENS, No. 68.	„ 22	—							51	82	4 10	—	846	Siemens No. 68 machine worked very satisfactorily, and a good light was maintained all night. The commutator and brushes are in good order.
GRAMME, Right hand.	Mar. 22	6.15	5.58	11 43	12 0	55	58	58	55	74	5 4	—	450	Gramme right-hand machine worked better last night, and a good light was maintained. It flashed frequently at the commutators, and the left-hand one is in bad order.
SIEMENS, No. 68.	„ 23	—							55	80	4 11	—	849	Siemens No. 68 machine worked very satisfactorily all night, and a good light was kept. Very little flashing took place only when the lamps were changed.
GRAMME, Right hand.	Mar. 23	6.16	5.56	11 40	12 2	56	55	56	56	67	5 4	—	453	Gramme right-hand machine worked satisfactorily, very little flashing took place, and a good light was kept all night. Made another trial with the left-hand one, but cannot get a light. Tried all the connections of the wires; they are all tight, and making a good contact.
SIEMENS, No. 68.	„ 24	—							56	80	4 10	—	844	Siemens No. 68 machine worked very satisfactorily, and a good light was maintained all night. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 24	6.18	5.53	11 35	14 0	56	58	60	56	80	5 5	—	454	Gramme right-hand machine worked satisfactorily all night, and a good steady light was kept all night. I have not been successful in getting the left-hand one to work yet.
SIEMENS, No. 68.	„ 25	—							56	86	4 8	—	852	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 25	6.20	5.51	11 31	12 0	60	60	62	60	76	5 3	—	462	Gramme right-hand machine worked well, and a good steady light was kept.
SIEMENS, No. 68.	„ 26	—							60	82	5 0	—	860	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 26	6.21	5.49	11 28	13 2	58	64	65	58	80	5 3	—	449	Gramme right-hand machine worked well all night, and a good light was kept. The lower brush on the left-hand commutator burns away very quickly.
SIEMENS, No. 68.	„ 27	—							58	87	4 8	—	849	Siemens No. 68 machine worked satisfactorily, and a good steady light was maintained.
GRAMME, Right hand.	Mar. 27	6.23	5.47	11 24	12 0	58	59	60	58	78	5 5	—	456	Gramme right-hand machine worked satisfactorily, and a good light was kept all night.
SIEMENS, No. 68.	„ 28	—							58	86	4 8	—	835	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 28	6.25	5.44	11 19	13 2	58	66	65	58	78	5 7	—	453	Gramme right-hand machine working satisfactorily, and a good light was kept all night. Flashing occurred frequently at left-hand commutator.
SIEMENS, No. 68.	„ 29	—							58	88	4 4	—	837	Siemens No. 68 machine worked satisfactorily, and a good steady light was maintained. Have this morning trued up the commutator plates. Bearing, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 29	6.26	5.42	11 16	11 2	60	58	62	60	74	6 2	—	458	Gramme right-hand machine worked satisfactorily, and a good light was kept all night.
SIEMENS, No. 68.	„ 30	—							60	80	4 4	—	858	Siemens No. 68 machine worked satisfactorily, and a good steady light was maintained. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 30	6.28	5.40	11 12	13 2	64	66	65	64	82	5 4	—	461	Gramme right-hand machine worked satisfactorily, and a good light was kept all night.
SIEMENS, No. 68.	„ 31	—							64	90	4 6	—	861	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	Mar. 31 April 1	6.30	5.38	11 8	11 2	56	60	62	56	73	5 9	—	448	Gramme right-hand machine worked satisfactorily, and a good light was kept all night. Bearings in good order. Left-hand commutator very rough.
SIEMENS, No. 68.		—							56	84	5 0	—	857	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
GRAMME, Right hand.	April 1	6.31	5.35	11 4	12 0	62	60	60	62	76	5 6	—	452	Gramme right-hand machine worked satisfactorily, and a good light was maintained all night.
SIEMENS, No. 68.	„ 2								62	92	5 2	—	859	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained. Bearings, commutator plates, and brushes in good order.

SOUTH FORELAND.—TRIAL OF "GRAMME" AND "SIEMENS" MACHINES (*concluded*).

Machine.	Date. — 1877.	Time of Lighting.	Time of Extinguishing.	How long Worked.	Coke Consumed.	Temperature of Engine-Room. — Degrees Fahr.			Temperature of Coils of Machines. — Degrees Fahr.		Carbons Consumed.		Revolutions of Machines.	Remarks.
		P.M.	A.M.	Hrs. Min.	Cwt. qrs.	Sunset.	Midnight.	Sunrise.	Sunset.	Sunrise.	½-in.	⅝-in.		
											Ft. In.	Ft. In.		
GRAMME, Right hand.	April 2	6.33							63	78	6 1	—	451	Gramme right-hand machine worked very unsatisfactorily; it was run with difficulty all night. The left-hand commutator is in so bad a state it will require to be repaired before it can be worked again.
	„ 3	—	5.33	11 0	12 2	63	60	62						
SIEMENS, No. 68.									63	90	6 0	—	853	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
HOLMES, No. 4.	April 3	6.35							60	Not taken.	—	4 5	400	Holmes No. 4 machine was worked all night. Gramme machines both out of order.
	„ 4	—	5.31	10 56	10 2	60	62	67						
SIEMENS, No. 68.									60	82	5 1	—	857	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
HOLMES, Nos. 3 & 4.	April 4	6.36							62	Not taken.	5 6	—	400	Holmes Nos. 3 and 4 machines were worked to the low lighthouse all night. Fog during first and second watch.
	„ 5	—	5.28	10 52	13 2	62	64	64						
SIEMENS, No. 68.									62	82	5 11	—	857	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.
HOLMES, No. 4.	April 5	6.38							58	Not taken.	4 7	—	400	Holmes No. 4 machine was worked to the low lighthouse all night.
	„ 6	—	5.26	10 48	11 0	58	58	56						
SIEMENS, No. 68.									58	98	5 6	—	843	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. This morning renewed the commutator plates and brushes.
HOLMES, No. 4.	April 6	6.40							60	Not taken.	4 7	—	400	Holmes No. 4 machine was worked to the low lighthouse all night.
	„ 7	—	5.24	10 44	13 2	60	62	62						
SIEMENS, No. 68.									60	88	5 4	—	862	Siemens No. 68 machine worked very satisfactorily, and a good steady light was maintained all night. Bearings, commutator plates, and brushes in good order.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLII.

TABLES OF THE DISCHARGE OF GAS IN CUBIC FEET PER HOUR, THROUGH PIPES OF VARIOUS DIAMETERS AND LENGTHS, AT DIFFERENT PRESSURES (*concluded*).

By THOMAS G. BARLOW. Extended by THOS. NEWBIGGING.

(The specific gravity of the gas is taken at ·4, air being 1.)

Diameter of Pipe, 28 *Inches.*

Length in Yards	1000.	1500.	2000.	2500.	3000.	4000.	5000.
Quantity delivered with 0·5 inch pressure	198,000	161,000	140,000	125,000	114,500	99,000	88,600
„ „ 0·6 „	216,866	176,752	153,362	136,533	124,891	107,956	96,314
„ „ 0·8 „	249,782	204,271	176,752	157,701	143,942	124,891	111,978
„ „ 1·0 „	280,000	229,000	198,000	177,000	161,000	140,000	125,000
„ „ 1·2 „	306,724	249,782	216,866	193,687	176,752	153,362	136,533
„ „ 1·5 „	342,921	280,000	241,000	216,000	198,000	171,000	153,500
„ „ 1·8 „	375,626	306,724	265,658	237,081	216,866	187,336	167,227
„ „ 2·0 „	395,841	322,812	280,000	250,000	229,000	198,000	177,200
„ „ 2·5 „	442,411	360,914	313,074	280,000	255,000	222,000	198,000
„ „ 3·0 „	484,747	395,841	342,921	306,724	280,000	241,000	216,000

Diameter of Pipe, 30 *Inches.*

Length in Yards	1000.	2000.	3000.	4000.	5000.	7500.	10,000.
Quantity delivered with 0·5 inch pressure	234,000	166,000	135,000	117,000	105,000	86,000	74,500
„ „ 0·6 „	257,580	182,250	148,230	128,790	115,182	94,041	81,405
„ „ 0·8 „	296,460	210,195	171,315	148,230	132,435	108,135	94,041
„ „ 1·0 „	332,000	234,000	192,000	166,000	149,000	121,500	105,000
„ „ 1·2 „	364,500	257,580	210,195	182,250	162,810	132,435	115,182
„ „ 1·5 „	407,025	287,000	234,000	203,000	182,000	149,000	128,500
„ „ 1·8 „	445,905	315,657	257,580	222,345	199,260	162,810	140,940
„ „ 2·0 „	470,205	331,695	270,000	234,000	210,000	172,000	149,000
„ „ 2·5 „	526,095	371,790	303,750	263,000	234,000	192,000	166,000
„ „ 3·0 „	575,910	407,025	331,695	287,955	257,000	210,000	182,000
„ „ 4·0 „	664,605	470,205	383,940	331,695	298,000	243,000	210,000

Diameter of Pipe, 36 *Inches.*

Length in Yards	1000.	2000.	3000.	4000.	5000.	7500.	10,000.
Quantity delivered with 0·5 inch pressure	370,915	262,440	213,451	185,457	165,862	135,419	117,223
„ „ 0·6 „	405,907	286,934	234,446	202,953	181,783	148,366	127,720
„ „ 0·8 „	468,892	330,674	271,013	234,446	209,952	171,285	148,366
„ „ 1·0 „	530,000	370,000	303,000	265,000	234,000	192,000	166,000
„ „ 1·2 „	573,868	405,907	330,674	286,934	257,016	209,952	181,783
„ „ 1·5 „	642,103	456,000	372,000	322,000	288,000	234,900	204,000
„ „ 1·8 „	703,339	496,886	405,907	351,669	314,928	257,016	222,199
„ „ 2·0 „	741,830	524,880	428,000	372,000	332,000	271,000	234,000
„ „ 2·5 „	829,310	586,116	477,640	416,000	372,000	303,000	265,000
„ „ 3·0 „	908,042	642,103	524,880	454,546	407,000	332,000	288,000
„ „ 4·0 „	1,049,760	742,180	605,361	524,880	468,892	384,000	332,000

The above tables are calculated upon the basis of the specific gravity of the gas being ·400. The quantity of gas of any other specific gravity discharged may be ascertained by multiplying the quantity indicated in the table by ·6325 (the square root of ·400), and dividing by the square root of the specific gravity of the other gas.

Example.

If a 12-inch pipe, 1000 yards long, discharges 23,800 feet of gas per hour, specific gravity ·400, at ·5 pressure, how much gas will the same pipe discharge, at the same pressure, when the specific gravity is ·560?

$$\frac{23{,}800 \times \cdot6325}{\cdot7483} = 20{,}116 \text{ cubic feet.—}\textit{Answer.}$$

The quantity of gas discharged at any other pressure may be ascertained by multiplying the quantity indicated in the table by the square root of the new pressure, and dividing by the square root of the original pressure.

Example.

If a quantity of gas equal to 23,355 cubic feet is discharged in one hour at a pressure of 1·2 inches, what quantity will be discharged through the same pipe at 2·2 inches pressure?

$$\frac{23{,}355 \times 1\cdot4832}{1\cdot0954} = 31{,}623 \text{ cubic feet.—}\textit{Answer.}$$

To facilitate these calculations, tables are annexed of the square roots of specific gravities from ·350 to ·700, rising ·005 at a time; and of the square roots of pressures from 1-10th of an inch to 4 inches, rising 1-10th at a time.

TABLE.

Square Root of the Specific Gravity of Gas from ·350 to ·700.

Gravity.	Square Root.	Gravity.	Square Root.	Gravity.	Square Root.	Gravity.	Square Root.
·350	·5916	·440	·6633	·530	·7280	·620	·7874
·355	·5958	·445	·6671	·535	·7314	·625	·7905
·360	·6000	·450	·6708	·540	·7348	·630	·7937
·365	·6041	·455	·6745	·545	·7382	·635	·7969
·370	·6083	·460	·6782	·550	·7416	·640	·8000
·375	·6124	·465	·6819	·555	·7449	·645	·8031
·380	·6164	·470	·6856	·560	·7483	·650	·8062
·385	·6205	·475	·6892	·565	·7517	·655	·8093
·390	·6245	·480	·6928	·570	·7549	·660	·8124
·395	·6285	·485	·6964	·575	·7583	·665	·8155
·400	·6325	·490	·7000	·580	·7616	·670	·8185
·405	·6364	·495	·7035	·585	·7648	·675	·8216
·410	·6403	·500	·7071	·590	·7681	·680	·8246
·415	·6442	·505	·7106	·595	·7713	·685	·8276
·420	·6481	·510	·7141	·600	·7746	·690	·8306
·425	·6519	·515	·7176	·605	·7778	·695	·8337
·430	·6557	·520	·7212	·610	·7810	·700	·8367
·435	·6595	·525	·7246	·615	·7842		

TABLE.

Square Root of Pressures, rising by Tenths of an Inch, from One-Tenth to Four Inches.

Inches and Tenths.	Square Root.	Inches and Tenths.	Square Root.	Inches and Tenths.	Square Root.
1-10th.	·3162	1·5-10ths	1·2251	2·8-10ths.	1·6733
2-10ths.	·4472	1·6 ,,	1·2649	2·9 ,,	1·7029
3 ,,	·5477	1·7 ,,	1·3038	3 inches.	1·7320
4 ,,	·6324	1·8 ,,	1·3416	3·1-10th.	1·7606
5 ,,	·7071	1·9 ,,	1·3784	3·2-10ths.	1·7888
6 ,,	·7745	2 inches.	1·4142	3·3 ,,	1·8165
7 ,,	·8366	2·1-10th.	1·4491	3·4 ,,	1·8439
8 ,,	·8944	2·2-10ths.	1·4832	3·5 ,,	1·8708
9 ,,	·9487	2·3 ,,	1·5165	3·6 ,,	1·8973
1 inch.	1·	2·4 ,,	1·5491	3·7 ,,	1·9235
1·1-10th.	1·0488	2·5 ,,	1·5811	3·8 ,,	1·9493
1·2-10ths.	1·0954	2·6 ,,	1·6123	3·9 ,,	1·9748
1·3 ,,	1·1401	2·7 ,,	1·6431	4 inches.	2·
1·4 ,,	1·1832				

Should it be required to find the pressure in inches of water to discharge a certain quantity of gas of given specific gravity in an hour, through a pipe whose dimensions are known, the formula is,

$$h = \frac{Q^2\, s\, l}{(1350)^2\, d^5}$$

i.e., multiply the square of the number of cubic feet of gas to be discharged in one hour by the specific gravity of the gas, and by the length of the pipe in yards; divide the product by the square of the constant number 1350, multiplied by the diameter in inches raised to the fifth power, and the quotient is the pressure.

Example.

It is required to find the pressure in inches of water to discharge in an hour 12,000 cubic feet of gas, specific gravity ·5, through a pipe 8 inches in diameter and 1900 yards long. Thus—

$$\frac{Q^2 \times s \times l}{1350^2 \times d^5} = \frac{144{,}000{,}000 \times \cdot5 \times 1900}{1{,}822{,}500 \times 32{,}768} \times \frac{136{,}800{,}000{,}000}{59{,}719{,}680{,}000} = \begin{cases} 2\cdot3 \text{ inches} \\ \text{nearly.} \end{cases}$$

If the diameter of a pipe is required which will discharge a given quantity of gas under a given pressure, we have the formula—

$$d = \sqrt[5]{\frac{Q^2\, s\, l}{(1350)^2\, h}}$$

This can easily be calculated by a table of logarithms.

i.e., $\log. d = \frac{1}{5}$ (2 log. Q + log. s + log. l − 2 log. 1350 + log. h.)

Example.

It is required to find the diameter of a pipe 1240 yards long, to discharge 48,000 cubic feet of gas of the specific gravity ·4, in one hour, with a pressure of 2 inches. Thus—

2 log. Q = 2 log. 48,000	=	9·3624824
log. s = log. ·4	=	1·6020600
log. l = log. 1240.	=	3·0934217
		12·0579641
2 log. 1350 = 6·2606676 / log. h = log. 2 = 0·3010300 . .	=	6·5616976
		5)5·4962665
log. d	=	1·0992533

Therefore d = 13 inches, nearly.

The following axioms are worth remembering:—

1. The discharge of gas will be doubled when the length of the pipe is only one-fourth of any of the lengths given in the tables.
2. The discharge of gas will be only one-half when the length of the pipe is four times greater than the lengths given in the tables.
3. The discharge of gas is doubled by the application of four times the pressure.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

A VOLUMETRIC METHOD FOR ESTIMATING SULPHUR IN COAL GAS.

Sir,—Mr. Wright's letter in your last issue professes to remove all the objections I have made to his not very elegant modification of the volumetric process for the estimation of sulphur in gas; but a little consideration will, I think, show that his answer is not so completely satisfactory as he would have you believe.

Mr. Wright contends that the conditions, as regards the formation of nitric acid, are the same in Messrs. Silliman and Sadler's, my own, and his methods. As a matter of fact they are widely different, as in the first two the only ammonia that can get to the burner is that ordinarily contained in the atmosphere, whereas in Mr. Wright's the air is highly charged with ammonia; so much so, that it is difficult to breathe in a room in which the process is in action.

I do not at all agree with Mr. Wright's assertion, that the difference between gravimetric and volumetric results is clearly due to nitrogen acids. In Messrs. Silliman and Sadler's paper it will be found that the results given by the gravimetric process are often in excess of the volumetric, the extremes on either side being as much as 2·3 and 2·16 respectiveiy; ·27 being the average error computed from both deficient and excessive results, and not the average error due to nitric acid formed, as wrongly interpreted by Mr. Wright. It would be as logical to say that the gravimetric results were sometimes greater than the volumetric, *ergo* some alkali had been formed.

Now, it is curious that Mr. Wright's results, with his own mode of using the Referees apparatus should show so little difference in the volumetric as compared with the gravimetric estimation of the sulphur, whilst his results with the Referees apparatus, used in the orthodox manner—the gas burning at the same rate as in his own—show an excess of 5·75 of sulphur in the volumetric over the gravimetric estimation. I was so surprised by these results that I estimated the nitric acid, by the indigo method, in the liquor given by the Referees apparatus, and in that given by Mr. Wright's modification. The results, expressed in grains of sulphur per 100 cubic feet of gas, are, Referees = ·76; Mr. Wright's = ·74; proving conclusively that Mr. Wright's deductions, as to the cause of the great discrepancies he observed, are entirely erroneous.

With respect to my omitting to mention the possible formation of nitric acid in my method, I have simply to say that I have carefully tested for it on several occasions, and have as often failed to find it. I may mention here that the average difference I find between my method and the Referees is 8 per cent. of the total sulphur, not 8 grains per 100 cubic feet—that is to say, you would find 10·8 with the one to 10 with the other.

With respect to the loss by spurting, Mr. Wright states that he advises a watch-glass to be placed over the beaker. On referring to his first letter, I find he directs this to be done for the purpose of ascertaining when all ammonia is driven off, which would presumably be after the liquid had been boiling briskly for some time. This would certainly have the effect of preventing the loss by spurting; but, as every novice in alkalimetry knows, the moisture condensed on the under surface of the watch-glass would be alkaline all the time, thus indicating to the operator that he had not driven off all the ammonia, even when he had boiled nearly all the water away. This is explained when it is remembered that the liquid is always alkaline from the excess of soda added, so that the drops spurted up on to the watch-glass must necessarily give an alkaline reaction; indeed, it is usual in teaching students alkalimetry to impress upon them the necessity of washing back into the beaker all the moisture condensed on the cover after each boiling to expel carbonic acid.

With respect to the use of tincture of cochineal as an indicator, when Dr. Mohr introduced cochineal, some three years ago, as a means of estimating earthy carbonates in natural waters, I made numerous trials of it, and found it answered the purpose fairly well, although the results were not accurate. It very naturally occurred to me (as it did to many others) to use it in estimating the alkaline carbonates in commercial carbonates of soda and potash, &c., as it seemed possible by its use to be able to dispense with the requisite boiling after each addition of acid. I have a great deal of such work to do for soap and paper makers, and I should have been very pleased had it succeeded, as con-

siderable time would thus have been saved. It was, however, a failure, as I found that, although the neutral tint is but little affected by carbonic acid, the alkaline tint was decidedly, and I, in common with all I know, had to abandon it for the time-honoured litmus. If I had had any faith in it, I should most certainly have adopted it in my method for estimating sulphur in gas.

I quite agree with the statement Mr. Wright quotes from Sutton's "Volumetric Analysis," that the colour is not so much affected by carbonic acid as litmus; but it is a significant fact that in none of the methods given in that book for the estimation of alkalies or acids is the use of cochineal recommended. If other confirmation of my statement is needed, I would refer you to Messrs. Silliman and Sadler's paper in your JOURNAL for March 20, 1877, p. 423, in which it will be found that they state: "But since with litmus, and even with cochineal, the carbon dioxide obscures the point of neutralization, it is best to add a quantity of acid equal to the total alkali used, and after removing the carbon dioxide by boiling the liquid," &c. &c. Mr. Wright's experience is certainly peculiar in many respects, as also is his chemistry; for I find, in his first letter to you on this subject, he states that nitrite of ammonia is to be found in the products of the combustion of coal gas. How it can exist under the circumstances I fail to see. Again, in a letter to you on the revivification of foul lime, he gives an equation which is quite amusing in the utter impossibility of its terms.

With respect to the impurities to be found in commercial carbonate of ammonia, chloride as well as sulphate is often present, and would equally introduce error in his method; and, although it may be assumed that practical chemists would invariably test the purity of their chemicals before using them, still I think it advisable, when describing a process likely to be used by some who may not possess much knowledge of chemistry, to state exactly the precautions necessary to enable them to obtain exact results. This Mr. Wright failed to do in his first letter to you.

Why Mr. Wright should prefer to use the carbonate of ammonia in the base of the cylinder I cannot understand, as in a trial I have just made in this way with nearly three ounces, I found after twelve hours that all of it was volatilized, and not a trace left in the cylinder. I used no eduction-tube. The sulphur given in this experiment, estimated as sulphate of barium, was only 50 per cent. of the amount given by the Referees apparatus. This is not surprising, as I found the base of the cylinder so hot that I am sure any sulphate of ammonia which may have been there must have been volatilized.

From this it would appear that, for a test extending over 20 hours, the carbonate of ammonia would have to be renewed more than once, and also that the eduction-tube is very necessary, notwithstanding Mr. Wright's very positive assertion to the contrary.

I could mention other not unimportant difficulties attending the use of this process, but I know I have already occupied too much of your valuable space.

W. C. YOUNG, F.C.S.

Gas Examiner's Laboratory, Beckton Road, North Woolwich, E., Dec. 8, 1877.

NAPHTHALINE.

SIR,—M. Brémond appears to overlook the real cause of the increase of 6 to 8 per cent. in the illuminating power of a gas after its desiccation. This increase is due to the abstraction from the gas of a component (aqueous vapour) which is so pernicious in this respect that it reduces the temperature of the flame by an amount of heat equal to the amount necessary to raise, to the temperature of the flame, the quantity of aqueous vapour present. In other words, this increase is due to the removal of a cooling effect, and has nothing to do with any superior power that may exist in a dried gas of absorbing or retaining hydrocarbon vapours. Of this superior power I know nothing. I merely suggest that it remains to be proved. The experiments made by M. Brémond do not show any increased illuminating power beyond what is fully accounted for by the simple removal of the aqueous vapour. What is called the tension of aqueous vapour is a function dependent only on temperature. Now, by experiments made upon gas saturated with aqueous vapour at 70° Fahr., and afterwards desiccated, I find an increase of 7 per cent. in illuminating power, the gas *being measured* in its saturated state. Had the gas been measured and tested in its desiccated state, I conclude that there would have been a further increase of nearly 2½ per cent. in illuminating power, due to reduction in volume that takes place in drying. The tension of aqueous vapour in gas at 60° Fahr. is equal to about 1·8 per cent. in volume. Consequently, if gas companies were to deliver desiccated gas to their consumers burners, there would be nearly 2 per cent. less gas paid for. This has been entirely overlooked in the discussion that has been the result of M. Brémond's paper. It is true that this decrease in gas sold would be well balanced by superior quality, but in these days of large "make," companies would not soon get used to selling 2 per cent. less gas whilst using the same amount of coal.

I do not wish to interfere in any way between M. Brémond and Mr. Aitken, but finding that there was not a clear conception of the cause of the 6 to 8 per cent. increased illuminating power, I have been led to give this general explanation, which I trust will be found satisfactory.

Dec. 6, 1877. SELENIUM.

BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—As in some other institutions, such as that of the Civil Engineers, might it not be wise to have a class of associates as well as members? I am not aware that the idea is altogether a new one, but I think it would benefit a large class, who are now denied membership of the Association, to be allowed, on payment of a small annual subscription, to become associates, and be passed on to the higher grade upon their possessing the required qualifications. My idea would be to admit candidates, much in the same way as students are enrolled in the Institution of Civil Engineers, upon the certificate of a member under whom they are or have been, to allow them to attend the meetings and receive reports, but not to vote, and each to contribute to the funds—say 5s. a year.

I sincerely hope that this suggestion may commend itself in some shape or form to the executive of the Association, as there are, in almost every gas-works, assistants, clerks, &c., who intend eventually to become managers, to whom such a privilege, if granted, would be invaluable.

Nov. 29, 1877. STUD. B. G. M.

[If our correspondent will refer to the JOURNAL of Nov. 13, he will see that the suggestion he now makes has been anticipated by Mr. Key. —ED. J. G. L.]

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

TUESDAY, DEC. 4.

(*Before Lords Justices* JAMES, BAGGALLAY, *and* THESIGER.)

BEALE *v.* GWYNNE.

This case, previously reported in the JOURNAL, came on by way of appeal to-day. The question was a very narrow one. The plaintiff and defendant had entered into an agreement by which, for certain services rendered, the plaintiff was to be paid certain commission on gas-exhausters and machinery supplied by the defendant to gas companies and gas-works, and the point for decision was whether Vice-Chancellor Malins had too greatly enlarged the area over which the commission was to be paid, and to what the payment of commission was to be limited.

Mr. GLASSE, Q.C., Mr. C. RUSSELL, Q.C., and Mr. PHEAR appeared for the appellant, Mr. Gwynne; Mr. LOCOCK WEBB, Q.C., and another learned gentleman represented the respondent.

Their LORDSHIPS, without hearing the respondent's counsel, confirmed the decision of the Court below, holding that they were bound by the words used by the parties, and could not guess that, if they had been legally advised at the time of making the agreement, they would have otherwise expressed themselves.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

FRIDAY, NOV. 30.

(*Sittings at Nisi Prius, before Justice* MANISTY *and a Common Jury.*)

SEARLE *v.* THE BARNET LOCAL BOARD.

Mr. BOSANQUET and Mr. KINGLAKE (with whom was Mr. DAY, Q.C.) appeared for the plaintiff; Mr. WILLIS, Q.C., and Mr. FINLAY for the defendants.

The case for the plaintiff was that, in May of last year, he had been informed by the defendants surveyor that a connection ought to be made between his house, in the High Street of Hadley, and the main sewer. He had intended to do the necessary works himself; but at 6 a.m. on the 29th of May the defendants workmen, no notice having been previously given to the plaintiff, broke open a side gate, dug up a passage, and laid down a drain connecting the house with the main sewer. This work was done so negligently that the sewage percolated into the plaintiff's well, rendering it unfit for use, and necessitating his digging another.

The case for the defendants was that they had served the plaintiff with the proper notice before entering upon his land, and that the works done by them were executed with such care that leakage was impossible; but it was admitted that they had laid the drain-pipe across the top of the well. They, however, did not claim any credit for the novelty of the plan of laying drain-pipes close to drinking water, for the *locus in quo* showed that this device was included in the wisdom of our ancestors, there being two old drains near to the well, and, as is usual, a cesspool in its vicinity. The evidence for the defendants was that the water was impure before they had executed the works, and that the impurity was due to the surroundings already described. On this point, as on most of the others in the case, the evidence was conflicting.

The point of law arose thus: The defendants summoned the plaintiff before the justices at Barnet, and an order was made upon him for payment of the costs of the work—£26 16s. 11d. The contention on behalf of the defendants was that, as it was open for the plaintiff to have shown before the justices that the conduct of their servants was wrongful, he was stopped from going into that question on the present trial.

The jury awarded no damages for the wrongful entry, but on the claim for negligence they returned a verdict for the plaintiff—damages £15.

GREENWICH POLICE COURT.—TUESDAY, DEC. 4.

(*Before Mr.* BALGUY.)

INSUFFICIENCY OF WATER-FITTINGS.

Mr. *Thomas Brett*, of Asylum Road, Old Kent Road, appeared to a summons, at the instance of the Kent Water-Works Company, for neglecting to comply with a notice served upon him, requiring certain alterations in the pipes used for the supply of water to eleven houses in Ruby Street, Old Kent Road, of which he was the owner.

Mr. DICKSON, secretary, and Mr. MORRIS, engineer to the company, attended in support of the summons. The proceedings were taken under the 31st section of the Metropolis Water Act, 1871, which directs that in the event of any dispute as to whether the fittings of any person are in accordance with the regulations prescribed by the company, such dispute shall be settled by a court of summary jurisdiction on the application of either party.

The *Defendant* said he had 33 years experience as an engineer in the service of the Government, and the means of supplying water to the premises had been made in conformity to an order of the Camberwell authorities in 1875.

Mr. DICKSON said the company, in May last, determined to give a constant supply to the premises in the above neighbourhood, and regulations of the company, as to valves, stopcocks, and waste preventers were necessary. The object of the proceedings was to obtain an order for the defendant to do the work in a given time, Mr. Ellison, magistrate at the Lambeth Police Court, having decided that the requirements mentioned were necessary for premises adjoining those of the defendant.

Mr. BALGUY read the regulations pointed out to the defendant, a copy of which was given to him, and said he had no doubt defendant would read them before going to bed that night, and be acquainted with what was required to be done.

The *Defendant* said the water supplied was at such a pressure that the company's pipes had burst, and his own water-pipes, which served their purpose for 26 years, had also given way.

Mr. BALGUY made an order for the required work to be completed within a month.

QUALITY OF THE BIRMINGHAM GAS.—Mr. T. Jackson reports that during the month of November, at the four gas-making stations of the corporation, he made 20 examinations of the gas supplied to the borough. The maximum light in sperm candles was 18·38; minimum, 16·06; average, 17·18. The parliamentary standard is 15 candles, with Sugg's No. 1 "London" burner.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

LAMBETH VESTRY.—At the meeting on Thursday last, the Lighting Committee reported that they had fully considered the subject of the vestry employing their own workmen for lighting and extinguishing, and also cleaning the public lamps supplied by the London Gas Company; and they found on careful calculation that no cost would be saved beyond what might be obtained by the vestry authorizing the committee to direct the company to make a reduction of one hour per night in the time of burning—that is, by lighting half an hour after sunset, and extinguishing the lamps half an hour before sunrise. The contract has hitherto been from sunset to sunrise, and to fulfil this contract the lighting is commenced half an hour before the time specified, and the extinguishing at sunrise. he estimated amount saved, as suggested by the committee (reckoning a consumption of 4½ feet per hour, which is a fair average) would be 1642 feet per lamp per annum, and for the 733 lamps erected it gives a total of 1,203,586 feet, which at 3s. 3d. per 1000 feet is £195 11s. 7d., or say in round numbers £200 per annum. It was resolved that the vestry be recommended to adopt the suggestion that the committee made—viz., reducing the time that the lamps are kept burning. The report was adopted.

Report by Dr. Stevenson on the gas supplied by The Gaslight and Coke Company to St. Pancras, during the month of November, 1877:—Maximum light, estimated by sperm candles, according to the Act—18·6. Minimum light, sperm candles—16·0. Average light, sperm candles—17·0. Traces of ammonia, indicated by turmeric test paper—Traces on all occasions. Traces of sulphuretted hydrogen, indicated by lead test paper—None on any occasion. Sulphur 14·8 grains per 100 cubic feet of gas, on the average. The gas was of a higher illuminating power during November, than for some months past.

METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

The Usual Weekly Meeting of the Board was held on Friday last—Sir J. HOGG, M.P., in the chair.

A communication was received from the Vestry of St. Pancras, expressing disapproval of the intended proceedings of the Board in reference to the Metropolis Water Supply, and stating that the representatives of the vestry had been instructed to oppose the scheme.

Mr. WATKINS moved that the communication be entered on the minutes.

Mr. FURNESS seconded the motion.

More than half an hour was consumed in debating this question, and strong feeling was manifested on both sides.

Mr. FURNESS, in reply to a question, said the resolution arrived at by the vestry was without previous notice on the paper of business. The total number of vestrymen was 123, and the motion was carried in a meeting of 52, the dissentients being 17.

Mr. ROCHE objected to the proposal to enter such a communication on the Board minutes.

Mr. LEGG said if the resolution of the vestry had expressed approval of the Board's scheme, there would have been no question raised about entering it on the minutes.

Mr. ROGERS thought that, even though the Board might not endorse the sentiments of the letter, they were bound to treat the vestry with respect.

Mr. RICHARDSON denied that there was any precedent for entering upon the minutes of the Board such a communication from a vestry. The members of the Board were the representatives of the ratepayers, and were not to be instructed by the vestries how to act.

Mr. LESLIE said there were 24,000 ratepayers in St. Pancras, but the members of the Board for St. Pancras were not elected by them, but by the vestrymen.

Mr. RUNTZ said his views on the water question were well known, but he thought it would be a dangerous precedent for the Board to enter such a communication as this on their minutes.

Mr. COOKE said he thought the letter should be sent back to the vestry, with an intimation that the last paragraph could not be received.

Mr. SAUNDERS said he was certain that, if the letter had contained an unqualified approval of the action of the Board, it would have been at once ordered to be entered on the minutes.

Mr. FREEMAN moved as an amendment that only so much of the communication as expressed disapproval of the Board's action be entered, and that the portion referring to the instructions given to the representatives of the vestry be omitted.

Mr. RICHARDSON seconded the amendment.

Mr. COOKE objected to this course, and said if the letter was received at all it should be entered on the minutes without mutilation.

Mr. H. L. TAYLOR spoke strongly against the course proposed to be taken, and contended that a communication of this kind ought to be entered on the minutes in the usual way.

The amendment was, after some further conversation, put and carried.

Mr. LLOYD then moved, as a further amendment—"That the letter do lie on the table."

Mr. ADAMS seconded the amendment, which was put and negatived.

Mr. WATKINS called for a division, when there appeared

For the amendment	5
Against	34
Majority against	29

Mr. Freeman's amendment was also put to the vote and negatived, the numbers being 15 for, and 24 against. The communication, therefore, was simply received.

The Works and General Purposes Committee presented a report, submitting drafts of Bills prepared by the committee for the purchase of the interests of the Metropolitan Water Companies, and for providing a new supply of water for potable, fire-extinguishing, and other purposes, and recommending that the Bills be approved and sealed by the Board, and be then referred to the Parliamentary Committee, with instructions to take all necessary steps for promoting the same in the next session of Parliament.

Mr. ROCHE said it was his duty, as chairman of the Works Committee, to bring before the Board the two Bills which had been prepared in respect to the water supply of the Metropolis.

Mr. WATKINS asked whether these were the two Bills which, within the previous hour, had been put into the hands of members, marked "Private and confidential."

Mr. ROCHE said they were. These two Bills were very fully considered by the committee of the whole Board on Monday last. The preambles were duly discussed, the clauses were gone through one by one, various amendments were made, and the Bills now came before the Board with the sanction of a considerable majority of the committee. It was not his intention to take up any time on this occasion in explaining the general features of the Bills, as they were well known to every member of the Board, and printed copies of them had been in their hands for some time.

Mr. LEGG: Not two hours.

Mr. ROCHE said the first Bill to which he would direct attention was the "Metropolis Water Supply Bill." He took this Bill first, for the reason, well known to the Board, that it would have to be deposited by a given day, in pursuance of the Standing Orders of Parliament; whereas the second, which was the "Metropolis Water-Works Purchase Bill," need not be deposited so soon. The preamble of the first Bill was as follows:—"Whereas, with a view to the health of the Metropolis it is expedient that a proper supply of pure and wholesome water for the drinking and culinary requirements of the inhabitants should be provided and constantly laid on; and whereas, for the purpose of extinguishing fires and other public purposes, a supply of water constantly laid on at high pressure would be of great benefit to the Metropolis; and whereas, in order that water should be supplied as aforesaid, it is expedient that the Metropolitan Board of Works should be empowered to construct works," &c. Whatever difference of opinion might exist amongst members as to the details of the proposed scheme, he apprehended that there would be little or no difference as to the preamble of the Bill. No one, he assumed, was prepared to say that a proper supply of pure water was not necessary, or should not be provided, and constantly laid on to the inhabitants. Nor did he imagine there would be any difference of opinion as to the second allegation in the preamble—that a constant supply of water under pressure was essential for the extinction of fires. He did not propose to go into the arguments in favour of the scheme already adopted by the Board, because they had been gone into over and over again. In point of fact, he might take it for granted that practically the preamble of the Bill had been agreed to, and that, whatever discussion might take place would have reference only to the clauses. The scheme by which the objects contemplated in the Bill were to be carried into effect was well known. It was proposed to lay down a second set of pipes throughout the Metropolis for the purpose of conveying into every house a sufficient supply of pure water for potable purposes. The quantity required for those purposes was estimated not to exceed 8,000,000 gallons a day. It would be impossible to supply or to obtain a sufficient quantity of pure water if it were to be used in the same manner as the 120,000,000 gallons a day now supplied by the existing water companies. Hence arose the necessity for a second supply to each house. The Bill proposed to furnish such a supply, and to furnish it (with a view to fire-extinguishing purposes) under such conditions that in no part of the Metropolis should it be at a less pressure than 100 feet from the lowest level, which meant that in some districts it would be equal to 300 feet. The Bill provided that every one throughout the Metropolis should have a right to that supply in his house if so required.

A MEMBER: Then it is not to be compulsory?

Mr. ROCHE said the supply would not be compulsory if a person chose to do without it, but it would be compulsory upon him to pay his proportion of the expense. The only objections made to the Bill were these—first it was said that the Board could not obtain sufficient water for the purpose. The answer to that was the report of the Royal Commission of 1869. It was satisfactory to learn from that report that there existed within easy reach of London a supply of the best and purest spring water which, in case of need, would be readily available as an auxiliary source of supply in quantities, at all events, sufficient for drinking, if not for other purposes. That commission thoroughly investigated the subject; they examined a large number of witnesses, and the result of their labours was to establish the fact of the existence of sufficient water readily obtainable to carry out such a scheme as that which the engineer of the Board, assisted by two other eminent engineers, had prepared. As a second objection to the present proposal, it was said, "What an extravagant thing it is that you should use this pure water for the purpose of putting out fires." Well, no doubt there was a certain amount of force in that objection; but, would it not be better to put them out with pure water if dirty water could not be obtained for the purpose? And then the quantity of water required in this way was so small in proportion to the ordinary consumption, that it was scarcely worth consideration whether pure or impure water was employed. Out of every 400 gallons of water which came into the Metropolis in the course of a day, only one gallon was required for fire extinguishing purposes, or a total of 300,000 gallons out of the 120,000,000 gallons daily supplied at the present moment by the water companies. The necessity for using the proposed pure water supply for fire extinction was that that supply would be under high pressure, which was not the case with the impure water. Another objection urged against the scheme was this, that it was proposed to use meters, which would operate against the public taking the pure water supply at all. Nothing of the sort was contemplated; there was no intention to have meters, but the water would be conveyed to every house in the Metropolis, into an air-tight receptacle, so that it could be drawn off at all hours of the day. Such was the general scope of the Bill, and he would now simply ask the Board to approve the preamble. It would be observed that there were no financial clauses in the Bill. The Standing Orders of the House of Commons did not enable the Board to bring financial clauses into the Bill, but they would be inserted in the general Bill which the Board brought in every session, exactly in the same way as the Streets Improvement Bill of last session formed part of the Budget Bill of the Board. Taking, however, the cost of this scheme at £5,500,000, which he thought might fairly be assumed, he wanted to show what the annual charge to the ratepayers would be. It would amount to £225,000 a year, which represented a rate of 2¼d. But then there would be a saving of ¾d., because the Board did not have to pay for water to water the roads. Putting that aside, however, and taking, as he preferred to do, the total cost at £5,000,000, the sum the ratepayers would be called upon for to pay for management, repayment of principal, and interest, would amount to what he had stated. Against this he wanted to show what the companies did. Their present capital was £11,685,824, and they got out of the consumers annually £1,232,986, or 10½ per cent. upon that amount.

A MEMBER: This is altogether fallacious.

Mr. ROCHE contended that he was right, and that this amount would go on increasing. With these remarks, he moved—"That the preamble of the Metropolis Water Supply Bill be approved."

Mr. RICHARDSON seconded the motion.

Mr. LESLIE moved as an amendment—"That as the notices in the *Gazette* and London papers are at variance, in most important particulars, with the orders of the special Board on Wednesday, Nov. 14, 1877, the Bill, in its preamble and clauses, is not the Bill ordered on that day by the Metropolitan Board of Works, and must be abandoned." He said the reference of the Board on the water question was to a committee of the whole Board. That committee, however, delegated their duties to a sub-committee, by which course of action upwards of 30 members were deprived of the opportunity of knowing what steps were being taken until the sub-committee thought fit to make a report to the general committee. He was informed and advised by many able men that the committee had no authority to delegate their powers in that way. The committee, in their report to the special meeting of the Board of the 14th ult., boldly admitted "that they felt it desirable, with a view to the fullest consideration being accorded to the numerous and varied details involved in this question, to appoint a sub-committee to inquire into the whole subject," and it was by this sub-committee that the whole inquiry had been conducted. The report

to which the Board agreed at the meeting of the 14th of November was only signed by some members of the committee after the Board met, and before they had had any opportunity of even reading it. A second objection he had to the report was founded upon the provisions of section 23 of the Act 25 & 26 Vict., c. 102, which stated that no resolution made or passed by the Board for the raising or expenditure of money, or for the construction of new works, if the cost exceeded £20,000, should be carried into execution, or be deemed valid or binding, until confirmed by a subsequent meeting of the Board. That provision had, in his opinion, been violated by the course taken by a majority of the members, as had also section 31 of the same Act, which related to the mode in which committees of the Board were to regulate their proceedings. Mr. Roche had stated that the cost of the supplementary supply of water on the scheme proposed by the engineers was only £5,000,000, whereas, according to the estimate attached to that scheme, it was £500,000 more; and beyond this, the engineers being asked whether they could not make provision in their scheme for a supply of water for roads and streets, expressed their ability to do it, but said that it would involve an additional cost of £270,000. Mr. Roche conveniently omitted all reference to this fact. Another point he desired to bring before the Board was the question whether one of the engineers consulted by the Board had not an interest in certain works which it was proposed to purchase for carrying out the scheme recommended. [The honourable member proceeded, amidst many interruptions, to read some newspaper extracts; but after continuing some time the chairman ruled that he was entirely out of order in doing so.]

Mr. Watkins seconded the amendment, which was at once put to the vote and negatived, only two hands being held up in support of it.

Mr. Legg, speaking in opposition to the motion, said the Bill as now before the Board, had only been in the hands of members since twelve o'clock of that day. He did not rise to object to the preamble, but he did object to the mode in which it was proposed to carry out the scheme. He objected to the Board spending a large sum of money in Parliament next session in support of the Bill, because he felt sure that at the end of the session they would find themselves where they were at the present moment. Mr. Roche told the Board just as much of the scheme as he thought useful, but he did not always tell the whole truth. Mr. Roche told them that it would involve an enormous expenditure if the water companies were allowed to make provision for a supply of water for fire extinction. But he (Mr. Legg) would ask whether any of the companies had ever been communicated with as to what they could do it for. One very important point appeared to have been overlooked by the supporters of the scheme of the engineers—viz., that in the districts in which it was proposed to sink wells there were boards of health drawing their supplies from the same sources for the use of their respective districts. In the district in which he resided the supply of water to 100,000 inhabitants was thus provided. Now there was no provision in the Bill for meeting cases of that kind, and this Board would certainly have to meet the opposition of all these local authorities who would naturally object to having their water supply alienated for the use of the consumers in London. And it would certainly be very hard if these bodies were put to enormous expense in deepening their wells, because of the operations of this Board in their localities. Believing that none of these points had been looked into, and that the question generally was not ripe for discussion, he should vote against the motion. The matter had not been properly considered by the Board—the whole thing had been got up in a hurry, and with an evident design on the part of some members to thrust the Bill down the throats of their colleagues. When the question was before the General Purposes Committee they were told that there had been enough copies of the Bill printed for each member to have one, but at the time the clauses were passed there were not more than three or four members at the outside, besides the mover of the resolution, who had copies of the Bill.

Mr. Roche rose to order, and objected to any reference being made to what took place in the committee.

Mr. Legg, continuing, said Mr. Roche himself, for his own purposes, did not think it wrong to refer to what was done in committee, for he had already told the Board that the Bill was approved by a good majority in the committee, but when he (Mr. Legg) proceeded to give reasons why he objected to the course recommended by that majority, he was told that he must be precluded from referring to anything done in committee. He repeated the statement he had already made, that this Bill and the Purchase Bill had only been in the hands of members since the Board met that day, and therefore members had had no opportunity of even reading the clauses. Surely measures of such great magnitude required more consideration than had yet been given to them. Believing, as he did, that the time had not yet come for decision on the subject; seeing the enormous cost which the proposed scheme involved; seeing, moreover, that there was not one word in the Bills in reference to the City of London, nor as to how the outside districts of the Metropolis affected by the scheme were to supplied, he felt that there was a blot in the whole matter which could not be remedied, and he, for one, therefore, was not content to be bound hand and foot by the decision of the sub-committee, nor even by the committee of the whole Board. Did the Board propose to extend their control over the water supply to the districts beyond the Metropolis at present supplied by the water companies, in the face of their refusal to allow those places to come within the sewerage districts of the Metropolis? His opinion was that, instead of attempting to carry out this scheme, it would have been better for the Board to go to Parliament for a Bill to regulate the companies. There would then be no occasion for any further supply of water, nor for the enormous cost of purchasing the companies undertakings, which, if they did obtain power to buy, they would have to pay for on the footing of the incomes of the companies, with an allowance for prospective value. He moved, as a further amendment, that the consideration of the question be adjourned for a week.

Mr. Leslie seconded the amendment for the sake of saving, if possible, the enormous burden which this scheme would impose upon the ratepayers. There was no necessity for it on the authority of the report of the Royal Commission on Water Supply in 1869. They stated that, "As to the quality of the water from the Thames basin, we are of opinion that there is no evidence to lead us to believe that the water now supplied by the companies is not generally good and wholesome, and that for drinking purposes the hardness of the Thames water is quite unobjectionable, and in no way prejudicial to health. The weight of evidence seems in favour of hard water, as more free from certain dangers inherent in soft waters, on account of their greater solvent power; that, for cooking, no important objection to the Thames water has been clearly proved, except as regards the deposit in kitchen boilers, which deposit is easily removed; that, for washing and for manufacturing purposes generally, soft water is preferable, as more efficient and more economical; but there appear no means of expressing the amount of saving in a money estimate. Looking, however, to the fact that the hardness of Thames water is moderate in degree, and is still further reduced by boiling; considering also that the whole metropolitan supply for manufacturing purposes is exceedingly small, we cannot see that the disadvantages are of sufficient moment to render it necessary to go to some distance for soft water." They further stated that "The artificial softening process does not appear applicable to the Thames water on a large scale; that perfect filtration is highly essential to the quality of the water supplied; that this process, in many cases, is at present very imperfectly carried out, and that more efficient means of enforcing the law are required; that when efficient measures are adopted for excluding the sewage and other impurities from the Thames and the Lea, and their tributaries, and for ensuring perfect filtration, the water taken from the present sources will be perfectly wholesome, and of useful quality for the supply of the Metropolis." That was the opinion of the Royal Commissioners in 1869, and the last official reports on the quality of the London water showed that enormous improvements had been made by all the companies since that date. The companies would meet this project of the Board by saying, "We have carried out the recommendations of the Duke of Richmond's committee, and, if you will only leave us alone for a short time, it will be seen that neither of your Bills is at all necessary."

Mr. Walker urged that there should be no delay in coming to a decision. Most of the large towns in the kingdom had the water supply of the inhabitants in their own hands, and the same state of things should exist in London. If it could be brought about by the expenditure of five or six millions it would be worth the outlay.

Mr. Furness said it had been represented that the Board were about to impoverish the ratepayers by this large expenditure; but in his opinion the question involved in this water supply scheme was too important to be lowered down to a consideration of the amount of money to be spent upon it. The public had not that quantity of brain power that would enable them to understand the question—(laughter)—the public at large had not that amount of intelligence to understand this question thoroughly; and unfortunately those who undertook to lead, or rather to mislead, public opinion had been exceedingly active during the past fortnight in endeavouring to depreciate this scheme. He had no objection to the question being adjourned, because he believed, if it were better ventilated, there would be a larger amount of adherence to it. He was not a shareholder, nor was he a hireling of, or a tool in the hands of, any of the companies.

Mr. Tolhurst said he thought Mr. Legg's constituents would read the speech of their representative on this occasion with great regret, knowing how indifferently the south of London was at the present time supplied with water.

Mr. Rooke thought that all the members of the Board were agreed upon the question of the expediency of the purchase by the Board of the undertakings of the Water Companies, but on the Bill now before them there was great diversity of opinion. It was stated by Mr. Roche that the committee had gone carefully through these Bills. The fact was not so; they were gone through at express speed, and when clause 15 came up for consideration, the point whether the pressure of the water should be such as to give a height of 90 or 100 feet was disposed of in the twinkling of an eye.

Mr. Roche again rose to order, and protested against the proceedings in committee being alluded to.

Mr. Rooke said twelve months ago the New River Company entered into communication with this Board, stating that they were ready to give a supply of water at high pressure, at the same time asking the Board to state what number of hydrants should be fixed in the parish of Shoreditch. How was that communication treated? For a long time it remained entirely unanswered, and even up to the present moment no satisfactory reply had been given. More recently the same company entered into communication with the Board, stating that as Great Eastern Street was nearly completed, and the company intended to lay along one side of it a main at high pressure, they would be glad to know how many hydrants the Board desired, and where they should be placed. The Board unanimously decided to have ten hydrants fixed, and they were placed accordingly, at a cost of £79. These hydrants had certainly not proved a failure, for on a recent trial being made of them, with six out of the ten in full work in the middle of the day, they threw a stream of water 70 feet high.

Mr. Roche said the Fire Brigade had never yet tried them.

Mr. Watkins rose to order, and said it was intolerable that Mr. Roche should continually interrupt the speeches of those who were opposed to him.

The Chairman said every member had the right to speak without being interrupted.

Mr. Rooke said notwithstanding Mr. Roche's denial, it was a fact that Captain Shaw with his men had tried these hydrants.

Mr. Roche said Captain Shaw had no authority to do so.

Mr. Rooke said in that case the more shame upon the Board for having spent the ratepayers money without taking some steps to ascertain the power of the hydrants. Surely it was right to have them tried, and it was right that Captain Shaw should know from experiment their capability and power. As to the question of the future water supply of the Metropolis, he (Mr. Rooke) contended that the undertakings of the water companies should be purchased and extended, and he had long been an advocate for the use of hydrants for fire purposes. But he had yet to learn that a jet of water thrown even only to a height of 40 feet, which could be done by the present system, was not at the outbreak of a fire a very valuable thing, and one that the Board might well be proud of. The existing water-works might be purchased, and there was no reason for asserting that they were not adequate for fire purposes, or that the quality of the water was not sufficiently pure for the use of the inhabitants. Dr. Tidy, in a report which he made to the Association of Medical Officers of Health, stated: "About one-half the supply was derived from the Thames, one-third from the Lea and New River, and the rest from deep chalk wells. I am of opinion that my analyses prove that London enjoys a water supply of very considerable purity; and I am further convinced that, from a medical point of view, no substantial objection can be urged against its wholesomeness for dietetic and culinary purposes." The reports of Major Bolton and Dr. Frankland also showed that there was little or no cause of complaint in this respect. He (Mr. Rooke) sincerely hoped that the two Bills to be promoted by the Board would never become law.

Mr. Lloyd said he did not see much harm in the water companies, nor in the quality of the water supplied by them; but the question was whether the time had not now come when the supply of such a necessary of life as water should be in the hands of a public body, who had no profit to make out of it. To ask the Board to delay coming to a decision on the Bill now before them would be to peril their existence. If it were necessary, as he believed it was, that five and a half millions should be expended on a purer supply, the Board could do it on much more economical terms for the ratepayers than if the outlay were left to be made by the companies.

Mr. Fowler said he must candidly confess that he had no objection to the preamble of the Bill as an abstract question. The Board thought it advisable and necessary, and that the time had now come for them to take upon themselves the purchasing of the water companies, so that they might be in a position to regulate in every way the supply to the Metropolis, and to bring into practical operation all the Acts of Parliament passed for securing the purity of the water supplied to the inhabitants. On this they seemed to be all agreed. But when the present Bill was put forward, and the members were told that it was by the means here proposed it was intended to accomplish the latter object—that this measure represented the mode in which the Board were to carry out their idea—the

question was fairly open to debate as to whether this was really the best mode, whether the Metropolis ought to be charged with the expenditure of £5,500,000 in addition to the amount necessary to purchase the interests of the companies, and to incur this expenditure, before the Board had become the authority for controlling the supply, and were in a position to judge of the capabilities of the existing works for effecting their purpose. Moreover, would any engineer, or any one who knew anything about the question, believe that the estimate of £5,500,000 for carrying out this scheme would not be greatly exceeded? Would any one believe that if the water companies had expended a capital of £11,000,000 to erect their large engines and carry out a single service throughout London, the Board would be able to double that service at half the cost. He, for one —and he was not alone in the opinion, but was supported by numbers who understood the question better than he pretended to do—believed that the estimates upon which the Board were acting were perfectly illusory, and that the cost of the scheme was more than likely to be double. At present the Board had only heard one side of the question; they had taken up with one scheme. Why, the Royal Commission had before them seven or eight schemes. There was Mr. Bateman's scheme, which was to bring the whole supply of water for London from the Welsh hills by gravitation, which only involved a cost of £11,000,000. And yet the Board, without any examination whatever, and without having heard any evidence on the other side, were asked to jump to the conclusion that this scheme of Messrs. Bazalgette, Bramwell, and Easton was the best that could be adopted, although it was only an amplification of the present system, at a cost of one-half that amount. He did not say that the scheme was not a good one; all he contended for was, that before the Board went to Parliament to put it forward, they ought to consider (which they had not sufficiently done) what were the capabilities of the existing supply, and whether, if it required to be supplemented, any other and better scheme might not be more advantageous. He had no faith in the estimates—and they were mere estimates, and could not be used as the basis of any calculation as to the future cost of this undertaking to the ratepayers of the Metropolis. He contended most strenuously that the Board ought not to commit themselves to the principle of the measure without the most thorough investigation of its details, and without hearing what could be said on the other side. They were not otherwise warranted in going to Parliament with it, and he believed they would not be permitted to carry out the plan until the whole question had been thoroughly exhausted. He would not on any account raise a factious opposition to the views of the majority of the Board; but, under existing circumstances, he was bound to vote against proceeding with the Bill.

Mr. CUFFLIN said he should vote for the postponement, because he believed if the question was adjourned for six months this scheme would never be brought forward again. They were asked to agree to the preamble of the Bill, which stated that "whereas, with a view to the health of the Metropolis, it is expedient that a proper supply of pure water for the drinking and culinary requirements of the inhabitants should be provided and constantly laid on." All were of that opinion.

Mr. ROCHE: Then vote for it.

Mr. CUFFLIN: But then it was said that the scheme now before the Board would effect this object in the most simple manner. Simple! Why the very ground of his objection was that, instead of being simple, the means proposed were of the most complicated character, and such that no one would ever dream of carrying them out if the Purchase Bill was successful. The present Bill was wholly and solely framed to meet the report of the Fire Brigade Committee and the complaints of a want of pressure of water. The suggestion in regard to the supply of water for the public roads had been tacked on to this scheme to make it more acceptable to the parishes. It was said that there had been no opposition from other engineers. The Board might depend upon it they would have plenty of that when they got into the House of Commons. Why, if Messrs. Bazalgette, Bramwell, and Easton had not prepared the scheme themselves, they would be sure to have appeared in opposition to it; so members must not suppose the scheme was unassailable. He did not believe that the people of the Metropolis would consent to receive a second supply of water into their houses; and, as to the hydrants, it was certain that thousands of them would never be used for many years. In fact, the latter was only a sop to the parishes, who were told they would not have to pay for them, although the cost must come out af the rates. The second supply of water, amounting to a few gallons daily, would never be consented to by the inhabitants. Why, in many instances, the whole quantity would not be sufficient to make soup for the household. And this supply was to be guarded by penalties. No one was to use it for filling a kitchen boiler; and if a person drew a tumbler full of this water and, having drunk half, threw the remainder away, he would be liable to a penalty for waste. People would not submit to such regulations, nor could their servants, by any possibility, ever be induced to care out of which receptacle they drew the water they wanted, but would always take that which was handiest. As to the sources of supply, what would inhabitants of the districts scheduled think of a proposal to drain them of their natural supply, for Londoners to drink and water their streets with? As he said before, he did not believe that, if the existing water-works were in the hands of the Board, they would ever think of adoptiag this absurd proposal. Let the Board go for powers of purchase, and take time to consider whether there was any necessity for a supplemental supply.

The CHAIRMAN having intimated that he should vote against the amendment, the question was put to a show of hands, when there appeared—

For the amendment, to defer consideration of the Bill	16
Against	22
Majority against	6

Mr. WATKINS demanded a division; upon which the numbers were—

For the amendment	16
Against	22
Majority against	6

The original motion was then put, and, on a show of hands, was carried by 22 for, 17 against.

Mr. FOWLER demanded a division. The numbers were—

For the preamble	22
Against	17
Majority for	5

Mr. ROCHE proposed that the clauses should be agreed to. It was not desirable to say anything about them unless some one had an amendment to move.

Mr. SELWAY seconded the motion.

On a show of hands the motion was carried by 20 to 2.

Mr. ROCHE moved that these numbers be recorded on the minutes.

Mr. WATKINS said in that case he should call for a division.

The numbers then were—

In favour of the clauses	21
Against	16
Majority for	5

Mr. ROCHE moved that the seal of the Board be affixed to the petition for the presentation of the Bill to the House of Commons.

The motion being seconded, was, on a show of hands, carried by 21 to 13.

Mr. LESLIE called for a division, when there appeared—

For	23
Against	13
Majority	10

Mr. ROCHE moved that the petition and Bill approved be referred to the Parliamentary Committee, with instructions to take all necessary steps for the promotion of the same in the next session of Parliament.

The motion being seconded, was, on a show of hands, carried by 21 to 11.

Mr. ROCHE moved that the preamble of the Purchase Bill be approved.

The motion being seconded, was, on a show of hands, carried by 25 to 5.

Mr. RICHARDSON called for a division, when there appeared—

For the motion	29
Against	2
Majority	27

Mr. ROCHE moved that the clauses of the Purchase Bill be approved, which was carried by 25 to 1 without a moment's discussion.

A further motion referring the Bill to the Parliamentary Committee, with the necessary instructions, was carried with two dissentients.

CITY COMMISSION OF SEWERS.—At the meeting on Tuesday last, the Streets Committee made a report on the joint action agreed upon between the Commission and the Gas and Water Committee of the Corporation in fixing hydrants, stating that the commissioners contribution towards the cost of branches laid in main thoroughfares this year is estimated at £638. Mr. E. Davis asked if the pressure of water was such as to render these hydrants useful, and Mr. Beard replied that the hydrants already fixed had been recently tested by the Gas and Water Committee, and in his opinion the pressure of water was such as to render the hydrants useful for the purposes for which they were required. The engineer (Mr. W. Haywood) said the hydrants were required for two purposes—for the extinction of fires, and for flushing the public roadways. It was only with the washing of the public ways that this court had to deal, and he had no hesitation in saying that from these hydrants they would get a fine jet of water, which would be quite sufficient for all the purposes of the Commission.

CAMBERWELL VESTRY.—At the meeting on Wednesday last, the General Purposes Committee reported upon a letter from Mr. W. Morris, engineer to the Kent Water-Works Company, stating that arrangements had recently been made for a turncock to reside in the parish, and asking the vestry to grant the company permission to have the name and address of such turncock written on two or three of the public lamps, in order that the inhabitants might know to whom to apply in the event of an alarm of fire. It was recommended that permission be given, the lamps to be selected by the surveyor. The recommendation was adopted.

The following are the returns of the Society of Medical Officers of Health, on the composition and quality of the metropolitan waters in November, 1877:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen. — As Nitrates, &c.	Ammonia. Saline.	Ammonia. Organic.	Hardness (Clarke's Scale). Before Boiling.	Hardness (Clarke's Scale). After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	21·10	0·046	0·156	0·000	0·007	14·8	3·0
West Middlesex	19·40	0·042	0·160	0·001	0·008	15·7	4·2
Southwark and Vauxhall	20·50	0·053	0·100	0·000	0·008	13·7	3·3
Chelsea	17·90	0·042	0·110	0·001	0·008	13·2	2·8
Lambeth	20·60	0·053	0·133	0·000	0·009	14·3	2·8
Other Companies.							
Kent	27·30	0·003	0·366	0·000	0·002	19·4	5·1
New River	20·50	0·050	0·100	0·000	0·006	14·0	2·4
East London	19·80	0·032	0·110	0·001	0·007	15·4	2·8

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY, M.B.

STRATFORD-ON-AVON LOCAL BOARD OF HEALTH.

PROPOSED PURCHASE OF THE GAS-WORKS.

At the Ordinary Meeting of the Board on the 27th ult.—Mr. R. GIBBS presiding,

The CHAIRMAN called attention to the advertisements which had appeared of the intention of the Gas Company to apply to the Board of Trade for a Provisional Order. He said he had no notion what the company intended to do; he believed their ostensible object was to raise more capital, but it could easily be imagined that such an undertaking might be perverted into a vast monopoly. Now, there was a very general opinion that the suppy of gas and water should be in the hands of the local authorities, and not of private individuals, so as to be utilized for the benefit of the towns. According to the advertisement, the company sought for most comprehensive powers—if they obtained their order, he did not know what they could not do. Therefore it behoved that board, in the interest of the public, to carefully watch the proceedings of the company. It was highly desirable, as he said before, that such undertakings should be in the hands of the governing body of the town, therefore they should watch every move having for its object an increase of the company's power. According to the Public Health Act he believed the local authority could not take, compulsorily, the property of the gas company, unless three-fourths of the shareholders, in number and value, were consenting parties thereto, and the question would have to be considered whether the local authority should not at once endeavour to make terms with the company with the view of acquiring their property, so as to carry on the works for the benefit of the town and not of private individuals. In the event of the company declining to sell, then a strict watch should be kept on their proceedings, so that they should not acquire an undue amount of power.

The MAYOR said the subject had been brought before him by two or three gentlemen with the view to the corporation taking steps to acquire the gas-works; but as the Board of Health intended taking up the matter, there was, perhaps, no necessity for the former body to interfere. At the same time he knew of many towns where the corporations had effected the purchase of such undertakings.

The CHAIRMAN explained that in such towns the corporation acted as

the sanitary authority; there was no separate board of health. He thought it would be for the board of health in the present case to carry out the purchase; at the same time they would be very glad of the assistance of the corporation.

The CLERK said on a former occasion, when the gas company sought increased powers, the board of health acted in conjunction with the corporation in opposing the application. In his opinion the board of health were the proper body to effect the purchase.

Mr. JAMES COX, jun., said, viewing the gas company as practically a monopoly, it devolved upon the board, in the interest of the public, to at once take action in the matter. He thought they should not be doing their duty, as representatives of the public interests in the town, if they did not, at any rate, carefully watch the proceedings taken by a body possessed of such great powers as the gas company already held. The Order was sought for ostensibly for the purpose of raising capital; but under cover of that those who had read the notice knew that almost anything might be done. He held a very strong opinion that it was very desirable public bodies should acquire possession of gas-works, if possession could be obtained on fair and equitable terms. But whether that was feasible or not, they should not suffer an extension of great powers and privileges to any one outside the representative bodies of the town, and more especially to private individuals having the entire monopoly of the lighting of the town. They should watch such matters very carefully. What powers were sought by the company it was impossible to tell; the notice was comprehensive enough for anything. The board, he thought, should at once take the subject into their own hands; should inquire into all matters connected with it—of the power the gas company had of breaking up their streets and thoroughfares, at all and at any time, without reference to that board. The board had the care and the custody of the streets, and it would be well if the lighting of them was also in their hands. He thought it was in the power of the local authority, in the event of their not being satisfied with the action of the gas company, and unable to acquire possession of the works on fair and equitable terms, to erect fresh works in the interests of the ratepayers. The company were now asking for such additional powers as would give them an undue monopoly in the town, and it was the duty of the board to oppose their application. The board should deal with the matter at once. He suggested that instructions be given the Executive Committee to consider the whole subject, and report to an early meeting of the board.

The MAYOR doubted whether the board had power to erect gas-works except for the purpose of supplying the street-lamps.

The CLERK said the law was very clear on one point—supposing no other company to be in existence, then the board had power to erect works of their own. He thought an Act of Parliament would be required, in the case of a company already existing, before the board could proceed with such an undertaking.

Mr. COX said that, from the advertisement, it must be quite evident to all that the company sought to acquire powers to do anything—to "alter, vary, and extinguish" everything and everybody—gas and all. The board would be very remiss in their duty to the public if they did not carefully watch the company's proceedings. He thought he was hardly understood respecting what he said about the erection of new works. He was of opinion that the board of health should ascertain as soon as possible upon what terms the gas company would part with their interest in the works, and the subject should be taken into consideration by the board at an early date. If, after receiving a fair and equitable offer, the company refused to part with their property, then steps should be taken by the board and the corporation to oppose their Bill in Parliament, and even to take further steps if necessary. He moved—"That the Executive Committee be empowered to take into consideration the application proposed to be made to Parliament by the gas company, and to report to this board at an early date."

Mr. E. GIBBS seconded the proposition, which was unanimously carried.

COAL GAS AND ITS SUBSTITUTES.

Mr. Thomas Collinge delivered a lecture on "Coal Gas," at the West Street School-Rooms, Rochdale, on Tuesday, the 27th ult. In introducing his subject, he gave a brief and comprehensive sketch of the history of the discovery and application of gas, and passed on to a consideration of the composition of coal, and subsequently to the properties of coal tar. The close of the lecture was devoted to a narration of different modes of lighting. On this point he remarked:

Various attempts have been made to supplant coal-gas lighting, one notably—viz., the formation of the Air Gaslight Company in London, with a capital of £200,000, in the years 1874-5. I acted as chemist for this company. The process consisted in taking the light spirits distilled from American petroleum and blowing air through them. These spirits are remarkably volatile; so much so that 1000 cubic feet of air will take up as much as nine gallons of the spirit, making a quality of gas equal to 40 candles; four gallons will equal 16-candle gas, but, as the cost of the oil varies from 1s. 6d. to 2s. 6d. per gallon, it makes the cost of 1000 feet of gas made by this process from 6s. to 8s. We lit up the north transept of the Crystal Palace with 2500 lights by this process. [?] We went to the Richmond Gas-Works, Surrey, and charged their holders with the gas, and sent it out to their customers in lieu of coal gas, but the cost of this gas was so great in comparison with coal gas that the process had to be abandoned, the company after several losses (including a cargo which was blown up in the Thames) winding up in the Court of Chancery. To give you some idea, I have here a bag of air and a small generator charged with the light spirit I have been telling you of. I shall now force this air through the generator, and conduct it to a gas-jet where you will see it burn like ordinary coal gas.

Another rival has been found in the electric light; the cost of producing this light by what is known as the Gramme machine is 9d. per hour for a light equalling 2000 candles, or about 100 gaslights. The light, in the present state of our knowledge, has very many disadvantages, amongst which may be mentioned the sudden liability to go out from no apparent cause whatever, thus necessitating the continued presence of an attendant to renew the carbon points. It has been proposed to use two lights to overcome the difficulty of the light going out. Another disadvantage is the intensity of the shadows produced; and the unpleasant contrast of light and darkness is a very important objection to its use. It may be here stated that in using this light in the excavation of the London Docks, the shadows were so powerful as to cause the men to imagine that the ground had opened in front of them, making them afraid to stride. If there should at any time be an attempt to light our streets with the electric light, the extraordinary distance this light would have to be from its work would reduce its power considerably by a well-known law that light decreases in intensity inversely as the square of the distance increases.

One among the advantages which this light has, is that it will give its light independent of all atmospheric influences—it will burn in water, in oil, just as well as in the air. This quality renders it of great value for submarine purposes. It can be used with great effect in lighthouses, and is, in fact, so used at the South Foreland, Dungeness, and Cape Grisnez lighthouses.

On the table I have a small electric light apparatus, which consists of eight cells of Grove's battery of platinum and zinc, charged with nitric and sulphuric acids; they are manifesting their energy along these wires to these carbons, which are fastened on to the end of those wires, and when I bring the points together you will see the light that is disengaged. If we were to draw a moral from this, it will be seen that great subjects have had small beginnings, and the apparently abstruse studies and unimportant experiments of to-day may become developed into great subjects on the morrow.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The end of the year is being marked by much of the quietude that has been characteristic of the whole of the preceding eleven months; but there is, it must be said, a good deal of present briskness in several departments. It would not, however, be wise or safe to infer from this fact that we are on the eve of any great improvement of trade, for we know that the few weeks just prior to Christmas are invariably characterized by a good deal of activity, so that the present spurt may or may not be wholly attributable to this cause only. In some branches, nevertheless, I hear of facts which tend to show that there is an alteration for the better; that the inquiries which are being currently received give some assurance of a rather more favourable state of things in the early part of the New Year. At the same time it must be said that in the local iron departments there is a general movement towards effecting a stricter limitation of the smelting production than has hitherto prevailed, and also a movement to reduce the wages of the men engaged in almost all the first processes of iron-making. The Parkgate Iron Company have issued a circular intimating that, although a profit has been made on the half year's trading, yet it has not been sufficient to warrant the payment of a dividend. This company have now only two of their six furnaces in blast, with a corresponding proportion of other appliances lying idle.

Pig iron prices are quiet, and inclined to be weaker still, owing to the monthly returns again showing a considerable augmentation of the stock in hand. At present, North Yorkshire brands are, generally speaking, about as under:—No. 1 foundry, 43s.; No. 2 foundry, 42s.; No. 3 foundry, 40s.; No. 4 foundry, 39s.; No. 4 forge, 39s.; mottled, 38s. 6d.; white, 38s.; refined metal, 57s.; Kentledge, 42s.; and cinder 35s., all net cash. Derbyshire and North Lincolnshire pig is also abundant and nominal in price. There is very little inquiry for ordinary manufactured iron, but a fair business doing in best ship plates, boiler plates, and good hoops.

The decision of the magistrates at Barnsley, in reference to the attempted restriction of the output of coal at the Lundhill Colliery, has been received with much satisfaction by the coalowners generally, even though a case has been granted for the decision of a superior Court. The Bench were decidedly of opinion that the men were under a proper and binding contract, and that they had inflicted loss upon their employers; they therefore gave a verdict for compensasation in each of the 125 cases.

The coal trade, as a whole, is quiet, and it hardly appears likely that any alteration of prices will take place this season.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

In the coal trade of this district there is little or no change to report. There is still only a moderate demand even for the best classes of round coal, owing to the continued mildness of the weather restricting the requirements for house-fire purposes, and for other classes of fuel no improvement in the demand can be looked forward to until there is more animation in trade generally, of which there is no prospect at present in this district. Although there are no stocks of any moment in best coal, other descriptions of fuel are very abundant in the market, common coal, burgy, and slack of the inferior sorts being still a complete drug, and many of the pits have to be put on short time, in consequence of the impossibility of getting rid of anything like their average supplies. Prices generally are much the same as last month, and the advance on best coal which was expected in some quarters has not been obtainable. The average quotations at the pit mouth may be given about as under:—Best Arley coal about 10s. 6d.; common ditto, 8s to 9s.; Pemberton four-feet, 8s. to 8s. 6d.; common round coal, 6s. 6d. to 7s.; forge coal, 5s. 6d. to 6s. 6d; burgy, 4s. 9d. to 5s. 6d; good slack, 3s. 6d. to 4s.; and common ditto, 2s. 6d. to 3s. per ton.

An important conference of delegates, representing the Miners' National Union, has been held in Manchester during the past week, for the purpose of considering the question of the limitation of the production of coal, and was concluded on Friday, when resolutions were passed to the effect that the over-production of iron and coal that now exists is the cause of the very low rate of wages that is now general, and of great privation and misery amongst the mining population; and the conference strongly counselled the miners to consider the advisability of meeting the evil by a limitation of the output. The miners, however, were recommended to abstain from individual action until after another conference of delegates has been held in Birmingham, in March next, to consider by what means and how far this limitation of the production can best be effected, whether by migration, emigration, or the actual limitation of the output of coal per man.

The iron trade continues very dull, and, although makers are generally firm at late rates, there is a good deal of underselling amongst merchants. There is, however, not quite so much "bearing" amongst speculators, and it would seem as if prices had at length reached their lowest point. In finished iron there are very few orders giving out, and local bars, delivered into the Manchester district can now be bought at from £6 5s. to £6 10s. per ton, according to quality. Middlesbrough puddled bars at £4 7s. 6d.; and Staffordshire ditto at £4 17s. 6d. per ton.

Works all through the district are extremely slack, and many of them stopped almost altogether.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipment of coals from the Tyne Dock reached 32,000 chaldrons last week. But until Friday there was a great difficulty experienced in getting coasting and sailing vessels to sea, on account of the prevailing stormy weather. Since that date the wind has got round to the west, and the sailings for the south from the coal ports have been very considerable. The shipments of best gas coals have been a full average. The price of best gas coals is 8s. per ton. There has been a very steady inquiry for the better sorts of gas coal, and the leading collieries are working full time. This can hardly be said of second-class pits. There is not much difference in value between the very best and medium qualities of gas coals, and as the freight is the same, gas companies, as a rule, prefer best. The market for second-class gas coals is, therefore, just a little unsteady. The coal offices have to do the very best they can for themselves, whereas for best sorts the outputs of the pits are got away without difficulty, and at full prices. Gas coals continue to be shipped for America, but not in such quantities as to materially affect the market. The recent mild weather

has tended to prevent any great activity in the house coal trade. Rates are about the same. The steam coal trade is in a most unsatisfactory state. One week of the fortnight's notice which the masters served upon the men has terminated. The men are disposed to refer the proposal of a reduction of 12½ per cent. on their wages to arbitration, but it is not quite clear whether the masters will agree to these terms or not. There is great anxiety and uneasiness over the whole business. In the meantime, the earnings of the pitmen in the Northumberland district are extremely low, through the bad time made by the pits.

The freight market is quiet. The coasting demand for coals is much below the average for the season, and the foreign orders are scanty. The rates paid steamers are 4s. 6d. to 4s. 9d. per ton, London; Rochester, 4s. 9d.; Havre, 6s.; Dublin, 7s. (gas); Hamburg, £6 to £6 10s. per keel. Mediterranean rates are pretty firm outwards with coal, on account of the bad home business.

The condition of the general trade of the North of England is absolutely unaltered. Though stocks are low through recent shipments to fulfil contracts; the chemical market is inelastic and extremely dull. The iron trade could not well be worse. On account of the disturbed political relations existing in France, business to that country is falling off very materially. Now that the Baltic is closed, there is little business doing in fire-clay goods, cement, and other material used in furnace building and repairing.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The usual monthly meeting of the Dundee Gas Commission was held last Wednesday, when the various committees were reconstituted. On the same day the Lighting Committee of the Police Commission was held, when the question of the improved lighting of the town came up for discussion. A great many new lamps were ordered to be erected throughout the town, more particularly in the back courts of that part of the town known as Lochee.

At the last meeting of the Edinburgh Town Council, Mr. J. F. King, public analyst, submitted his report upon the quality of the gas supplied to the city on Nov. 27. It showed that the Edinburgh Company's gas had an illuminating power of 28·20 standard candles, while that of the Edinburgh and Leith Company had an illuminating power equal to 27 candles. For the week ending Dec. 1, Dr. Wallace found the Glasgow gas to give a minimum illuminating power ranging from 25·68 candles to 27·38 candles. The maximum ranged between 27·55 candles and 28·83 candles (West Street), while the average ranged from 26·86 to 28·01 candles.

The complaints about the gas in the east end of Glasgow, referred to in last week's "Notes," took very prominent shape at the Town Council meeting held last Thursday, Mr. Miller, the convener of the Corporation Gas Committee, and some of his colleagues seemed to be disposed to attribute the gloominess complained of to the change being made in the pressures, with the view of having it made more equable over the whole of the city. One member said he believed that they gave as high a pressure as was given in any other town in the kingdom; and another remarked that the importance of having the pressure in the mains attended to would be seen, when it was mentioned that formerly the annual loss from waste was £60,000. At the same meeting it was reported that an important extension of the mains to Yoker had been agreed upon, the estimated revenue obtained from which would be about £1300 per annum. The minutes of the Gas Committee contained a long report by the deputation which recently visited Manchester and London to inquire into the relative cost of stoking retorts by manual labour and by machinery; it concluded with the following recommendations:—"1. That before expressing any opinion on the use of charging and drawing machines at Dawsholm, Messrs. Adam Woodward and Sons be requested to put the machines they supplied to the Corporation in perfect working order (as they have done in Manchester), and that at their own expense. Afterwards it may be a question for consideration whether we should not get the necessary tools to do our own repairs, or get this done by contract. 2. That self-sealing lids be applied to all our retorts as they fall out of repair. These are in very general use in London, and universally approved there, as well as by our own manager. 3. That through retorts should again be tried at Dawsholm, and the mains and dip-pipes examined and adjusted; and, so soon as the drawing and charging machines are in order, and found to work well, in conjunction with through retorts, that Mr. Foulis be requested to report on the whole subject. 4. That windows should be put into the retort-houses at Dawsholm to admit more light, and at the other works as far as this may be necessary. 5. We would further recommend that the proposal as to bringing in the coals to Dalmarnock on a high-level railway should again be considered, as we found that plan almost universal in England, and productive of great saving and convenience. Further, that in any future alteration of the retort-benches at any of our works, arrangements should be made with the ultimate view of providing space on a separate level for the coke to be dropped into when drawn from the retorts, and quenched there before being wheeled into the bings, as the comfort and convenience connected with this system are very great, and the men are enabled to do their work in a much cooler atmosphere, and to much better advantage."

The question of gas supply in Airdrie, to which I referred last week, now promises to take a definite shape. It was under the consideration of the town council at their meeting held last Thursday, and in the course of the discussion Councillor Moffat, who is one of the directors of the gas company, said he believed that every director was quite willing to place the gas-works in the hands of the corporation; and he was of opinion that no obstacle would be placed in the way of the town council acquiring the property, due effect, of course, being given to the interests of the shareholders. Notice of motion was given to empower the town council to acquire the works and plant from the present company. It is expected that the subject will be fully discussed at the next meeting of the council.

A good deal of attention is now being given to the question of adopting the Burghs (Scotland) Gas Supply Act. Mr. Thomas Whimster, gas engineer, Perth, has been employed by the Burntisland Town Council to value the gas-works of that town, so as to enable the council to make an offer for them to the North British Railway Company. Mr. Brodie, of Paisley, and Mr. William Foulis, of Glasgow, have been engaged to act on behalf of the Police Commissioners and Gas Company of Johnstone respectively, in regard to the arbitration for the acquisition of the works and gas supply of that town. Mr. G. R. Hislop, of Paisley, has consented to act on behalf of the Wishaw Gas Company, and the same gentleman, I believe, was asked by the Police Commissioners to act as their representative in the arbitration. In the arbitration at Dumfries, Mr. B. M. M'Crae, of Dundee, is to act for the town council, and Mr. Samuel Stewart, of Greenock, is to act for the gas company. I should also mention, in reference to the Johnstone arbitration, that it was recently resolved to send a deputation from the Police Commissioners to Alloa, to make inquiry on the spot in reference to the arbitration which took place there some time ago, the first example of the complete adoption of the Act.

During the last fortnight the delivery of water into Edinburgh was at the rate of 6230 gallons per minute, equal to a supply of 31·28 gallons per head per day, to a population of 286,800. On the 4th inst. the quantity of water in store was 667,219,531 gallons, as compared with 614,724,803 gallons at the same date last year. The rainfall at the Glencorse reservoir up to the 4th inst. was 51·75 inches for this year, as against 41·30 inches last year, and 33·80 inches in 1875. The wet character of the past month in Scotland may be judged of by the following facts:—At Loch Alsh the rainfall from the 1st to the 28th of November was 12·60 inches, while from the 9th of October till the 29th of November there was only one dry day. At Killin the rainfall for the month was 10·25 inches, as against 2·22 inches in the same month last year. The past eleven months show a total of 51·64 inches, or 5 inches above the yearly average. At Greenock the rainfall was 12·38 inches, and at Loch Thom there was only one dry day in November.

At a meeting of the Kelso Police Commission, held on the 4th inst., it was unanimously agreed to adopt a scheme for the utilization of the town's sewage by irrigation. The plans of the scheme, which were prepared by Mr. Brunlees, of London, provide for the carrying of the sewage by gravitation to a place on the Hendersyde estate, about a mile and a half from the town, and the estimated cost is about £3000. It was remitted to a committee to make arrangements for acquiring the necessary ground. These works are rendered necessary by the operations of the Rivers Pollution Prevention Act, neighbouring proprietors having complained of the sewage of the town being allowed to fall into the Tweed.

The Glasgow pig iron warrant market was dull and languid during the most of last week, but on Friday there was a stronger feeling, and prices advanced 1½d. per ton, the close being, sellers 52s. 3d. cash, and buyers 52s. 3d. eight days.

There is little alteration to report in regard to the coal market. Orders are very scarce, especially for shipping sorts. House descriptions are moving a little better. Prices remain practically unchanged.

DRONFIELD GAS COMPANY.—The directors of this company have just issued 800 7½ per cent. new shares of £15 each, the whole of which have been taken up by the present proprietors.

INSTITUTION OF CIVIL ENGINEERS.—At the monthly ballot on the 4th inst., Mr. William Upton Tinney, manager of the Winchester Gas-Works, was elected an Associate of the Institution.

GAS LIGHTING IN SOUTH ESSEX.—The populous districts of South Ockenden, Orsett, Stanford-le-Hope, and Leigh are about to be lighted with gas by works to be erected by Mr. Henry Skoines. Meetings have recently been held at some of these places for explaining the details of the scheme, and much interest has been manifested therein.

HENGOED GAS-WORKS.—On Thursday last the new gas-works at Hengoed were formally opened. The works, which are built near the Maes-y-cwmmer factory, will produce about 4000 feet of gas per hour. Messrs. Willey and Co., of Exeter, were the contractors for erection, Mr. Lane being their foreman. The masonry was executed by Mr. W. Jones, of Hengoed, and the gas-fittings were put up by Mr. Gould, of Newport. At the opening ceremony, Mr. Lewis, the chairman, having made a few remarks, led Mrs. Perrott, of Hengoed Hall, to the meter-house, where that lady performed the act of turning on the gas, and the works were declared opened. A dinner was afterwards given at the Angel Hotel, and several houses in the town were illuminated at night.

DONCASTER WATER SUPPLY.—At the meeting of the Doncaster Town Council, on the 20th ult., the chief subject of discussion related to the water supply of the town, and it was agreed to apply to the Local Government Board for power to borrow £60,000 to complete the water-works. In the course of debate it was elicited that the original estimate for the works was £80,000, with an additional £5000 for contingencies; and it was stated at that time the estimate was thought sufficient, as was proved by its being adopted by Mr. Hawksley, and also by Mr. Rawlinson the engineer to the Local Government Board. It was also explained that the corporation were forced into constructing these works, as they were told that if the council did not immediately make them themselves, the Local Government Board would construct them, and charge them with the cost.

SUFFOCATION BY GAS IN DERBY.—An escape of gas in a house in Peel Street, Derby, on Sunday morning, the 2nd inst., has resulted in the death of the occupier, Mr. Knight. It seems that on that morning the attention of the neighbours was aroused by the fact that nothing was seen of Mr. and Mrs. Knight, and this led to the police being communicated with. Some constables came, and finding the doors of the house were fastened, they obtained a ladder and effected an entrance through one of the bedroom windows. As soon as this was done a strong smell of escaped gas was felt, and Mr. and Mrs. Knight were found in bed in a condition of stupor, and it appeared almost as though the latter was dead. Medical assistance was instantly summoned, and every effort made to aid the unfortunate sufferers, but Mr. Knight died on Tuesday morning. An examination proved that the escape arose through a nail having been driven through one of the pipes. The gas-fittings were only placed in the house on the previous Saturday. At the inquest a verdict of "Accidental death" was returned.

DIRTY WATER-CISTERNS.—Mr. C. E. Hatherly, M.R.C.S., writing to *The Times* on the Water Supply of London, says: "There has been a great deal written lately respecting 'water and its impurities;' but I scarcely believe that the householders of London can be aware how much of the grievance lies at their own doors. I think this assertion can be fully proved. It has become either a necessity or a fashion for almost every one to leave town for some weeks during the hottest months of the year. While the householders are away there is generally one servant, or a man and his wife, left in charge of the house, consequently very little water is used, and that in the cistern is somewhat stagnant, and from day to day less and less pure. On the return of families to London, after breathing purer air than this modern Babylon supplies, they begin to use this impure water, when, perhaps shortly after, one or more members are seized with irritation of the mucous membrane, diarrhœa, typhoid or low fever. The state of the water in a cistern which has not been cleaned out for, say, 12 months, would scarcely be credited by persons who had not seen it; when mixed with the accumulations scrubbed from the sides and bottom, it becomes a dirty, greasy compound, utterly unlike that liquid in a pure state."

ECKINGTON AND MOSBOROUGH GAS COMPANY.—At the annual meeting on the 1st inst., the following report of the directors was received and adopted:—"The capital of the company now amounts to £6000 in £1 shares, all of which have been fully paid. The mains of the company have been considerably extended, and others of larger capacity have been laid from the Church to near the 'Lion and Lamb Inn,' Eckington. The price of gas has been reduced from 5s. 10d. per 1000 cubic feet to 5s., and in the case of the Midland Company, from 5s. to 4s. 6d., commencing in all from the 1st of January. Eleven retorts worn out have recently been replaced with new ones, out of the revenue. The new gasholder has not been brought into use, consequent on its failure to hold water sufficient for the purpose, but efforts are now being made to complete it. The consumption of gas is still greatly on the increase, to provide for which great demands are made on the company's plant, especially on the retorts. The pressure on these

speedily renders them useless, through the deposit of carbon partially or wholly filling them up, and your directors have under consideration the purchase of a gas-exhauster, which will have the effect of relieving the retorts and propelling the gas as manufactured into the holder. The sum of £149 9s. 5½d. out of the revenue has been expended on capital account, the shares issued not meeting the demand on capital account by that amount. The net revenue account, irrespective of the above sum of £149 9s. 5½d., enables the directors to recommend the declaration of a dividend on 5179 shares at 1s. 4d. per share, and on the remaining 821 a dividend of 1s. per share."

Accident to Gas-Mains at Dukinfield.—On Friday morning last, about six o'clock, a portion of the bank of the Peak Forest Canal, near the Dukinfield Gas-Works, gave way, owing, it is supposed, to the subsidence of the ground underneath through mining operations. At the time, a boatman was approaching the spot with his canal boat, when the horse which was drawing it suddenly stopped, but the boat, with the momentum it had acquired, shot forward for some distance, and was gradually drawn unaccountably to the side of the canal. The man got out, and discovered the canal bank had given way, and that the water was rushing out of the canal with tremendous force into the River Tame, which runs alongside, not many yards distant, at a lower level. The volume of water escaping soon washed away the whole of the embankment for a distance measured almost by the length of the boat, which now lies across the aperture, and was at the time laden with cannel on its way to the gas-works. The embankment is formed of the natural shale rock of the locality, and great masses of this rock have been swept from their situation into the river bed. The gas-mains belonging to the Dukinfield Local Board, who have recently acquired the undertaking of the gas company, ran alongside the canal towing-path, or rather just outside the towing-path. These mains are 10 inches in diameter, and supply the lower part of the township with gas. One of the first effects of the landslip was to break up and carry away these pipes for a length of about 80 yards, thus cutting off the entire gas supply of the town in an instant. The gas in the mills and workshops, as well as the dwelling-houses, which had been lighted up, suddenly went out, and work had to be suspended until daylight appeared. Mr. Bridge, the manager of the gas-works, at once proceeded to make arrangements by which, until the damage is repaired, the gas will be turned through the old mains; the only difference to the public being that probably in the lower part of the township the pressure will not, for a while, be quite so great as usual.

Hull Water Supply.—At the meeting of the Hull Water-Works Committee, on the 26th ult., the engineer (Mr. D. Maxwell) presented the following report:—

Summary of Water Pumped, Coal Consumed, and Wages Paid at the Water-Works.

	Year ending Aug. 31, 1877.	Average of Five Years, 1872-6.
Water supplied to town, million gallons	1922	1691
Coals consumed at Springhead and Stoneferry	4739 tons	5316 tons
Cost of ditto	£2737	£5079
Coals consumed at both stations, per million gallons supplied	49·3 cwt.	62·9 cwt.
Cost of ditto	£1 8 6	£3 0 1
Wages paid at Springhead, including coal delivery	£1006 3 11	£918 9 9
Ditto at Stoneferry, ditto	953 13 6	1249 11 9
Wages of pipe-layers, turncocks, and clerks in office	1264 1 0	1733 9 7
Total wages	£3223 18 5	£3901 11 1
Wages per million gallons supplied	£1 13 1	£2 6 2
Coal and wages per ditto	3 1 7	5 6 3

The borough accountant reported that the balance of income over expenditure for the current year was £3321 8s., and the chairman added that, had all the amounts due on both sides of the account been received or paid, the balance would have been £4188 4s. 1d.

Tube-Wells.—At a meeting of the Society of Engineers, on the 3rd inst.—Mr. Thomas Cargill, C.E., President, in the chair—a paper was read by Mr. Robert Sutcliff, "On Tube-Wells for Large Supplies and in Various Strata." This paper was supplementary to one read at the previous meeting of the society on "Tube-Wells" by Mr. Le Grand, which dealt with the subject of tube-wells (commonly known as Abyssinian) of small size. Mr. Sutcliff, in his opening remarks, observed that in laying down plant for obtaining large supplies of water a number of tube-wells were coupled together by horizontal mains so that one pumping-engine drew from many tubes. In this way, for the last eight or nine years, the leading breweries at Burton-on-Trent had obtained the bulk of their water supplies. Messrs. Allsopp and Sons pump 600,000 gallons daily from thirty 3-inch wells, and Messrs. Bass and Co. 500,000 gallons from 25 tubes. Thus, in one town, two breweries are obtaining sufficient water for a town of 40,000 inhabitants. Although some of these Burton wells are within a stone's throw from the Trent, the quality, level, and temperature of the water differ from those of the river water. The town of Carmarthen in Wales is supplied by ten 2-inch tube wells. In sandy soils strainers or filters are used which prevent sand coming into the tubes. A tube-well was sunk in a very fine sand at Chislehurst by pumping up six barrow loads of sand, and replacing it with gravel. One advantage of the gravel filter is its imperishability and if made sufficiently large the velocity of the water is not enough to bring the grains of sand within the area acted upon by the pump. The author observed that, in rocks and other hard strata, the method of sinking tube-wells was similar to that employed in making artesian borings, but the mode of pumping and development of supply was entirely peculiar to the tube-well system. Bored tube-wells can be made through any stratum and to any depth that an ordinary artesian boring can reach. The Lower Grounds, Birmingham, with their ornamental waters, fountains, and extensive gardens, derive their entire water supply from a single 5-inch well sunk to about 200 feet deep. By means of this well an annual saving of £300 for water-rate is effected. Two tube-wells at West Thurrock yield a daily supply of 220,000 gallons from the chalk. In conclusion, the author observed that it was said that the first tube-well was a pointed bamboo driven into the earth, and the pump a "nigger" who sucked the water through the pores of the cane. Now, said Mr. Sutcliff, factories, breweries, and towns derive from them enormous supplies, and it is possible that coupled tube-wells in the chalk may solve the problem of providing London with pure water. The paper was well discussed by the members present.

Gas-Works Extension at Halifax.—The *Halifax Courier* says workmen are now busy laying the foundation of the arches, which are to cover in the Hebble for about 100 yards of its length, preliminary to the extension of the gas-works. The proposed extension is by far the most important which has been made since the works became the property of the corporation. The present works are capable, when in full operation, of producing 1,600,000 cubic feet of gas in one day of 24 hours, and that an extension is not contemplated too soon will be gathered from the fact that on a certain dark day last January the consumption was as much as 1,733,000 feet. This, of course, was exceptional; and, in consequence of bad trade, it seems unlikely that we shall have such a consumption on any one of the short days just before us—so far, indeed, the consumption this winter is less than last. But the daily productive power of the works should correspond pretty nearly with the daily consumption, inasmuch as there is barely holder room for a heavy day's supply. The three holders—two at the works and one at Stoney Royd—hold scarcely 1,600,000 feet, of which the Stoney Royd holder contains more than half, or 9 million feet, so that in winter it is impossible to have more than a day's supply in store. The new works are to have a productive power almost equal to the old—namely, 1,400,000 feet per day. All the plant and buildings will be placed on the land belonging to the corporation adjoining the present works—a course which will involve considerably less outlay in the first instance, and also lighten the cost of supervision afterwards. For the retort-house a site is already prepared, adjacent to the railway siding, the whole length of which will then be utilized. This retort-house will be built on the same principle as that now existing, having a coke depôt in the basement. Thus the coals will be close at hand on one side, and the coke when drawn from the retorts will be at once dropped into the depôt below. It is hoped that the new works will be ready by the fall of 1879; hence for two winters more the present works will have to suffice. It is not proposed to increase the holder-room until the manufacturing plant is put down, but another holder will then be needed, and this is to be put on the corporation land at Stoney Royd, adjacent to the large holder now used there, the mains and governor-house to which will also serve for the new holder. The new works will be distinct from the old in this sense, that the gas will be kept separate until it has passed the outlet of the station-meter, when it will be sent forward into the gasholders. By this means the gas manufactured in both the old and new works can be accurately measured. Two of the contracts—one for the buildings, and the other for the ironwork required in them—have been let. There will be a good deal of ironwork in the new buildings. The floors of the retort-house will be of iron plates, carried on iron beams and pillars, and the roofs of the various buildings will also be of iron. These two contracts, which are the only ones that will at present be entered into, have been let for £17,808. The contracts for plant will not be placed until the buildings are nearly ready to receive the plant. When this extension of the gas-works is finished, all the land belonging to the corporation on the present site (which includes both banks of the Hebble at the point where that stream is being arched over) will be utilized, and the next extension, now many years in the future, will no doubt be on the low-level site owned by the corporation at Salterhebble.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

4412.—Zipfer, F. H., Manchester, "Improvements in the construction of electric lamps." Nov. 23, 1877.

4420.—Kromschröder, J. F. G., Walthamstow, Essex, "Improvements in means or apparatus for carburetting and purifying coal gas." Nov. 23, 1877.

4423.—Gordon, J., Glasgow, "Improvements in apparatus for controlling and regulating the supply of water and preventing waste." Nov. 24, 1877.

4432.—Rapieff, J., Middle Street, London, "Improvements in the production and application of electric currents for lighting and other purposes, and in apparatus employed therefor." Nov. 24, 1877.

4434.—Clark, W., Chancery Lane, London, "Improvements in apparatus for condensing liquifiable gases and condensable vapours, and for cooling liquids." A communication. Nov. 24, 1877.

4435.—Varley, S. A., Hatfield, Hertford, "Improvements in electrical apparatus for lighting and other purposes." Nov. 24, 1877.

4440.—Nawrocki, G. W. von, Berlin, Germany, "Improved rotary apparatus for giving motion to or receiving motion from fluids, applicable as a propeller, pump, fan, water-wheel, windmill, and for similar purposes." A communication. Nov. 26, 1877.

4449.—Harrison, H., Huddersfield, Yorks, "Improvements in water taps or cocks." Nov. 26, 1877.

4452.—Wise, W. L., Adelphi, London, "Improvements in lighting apparatus." A communication. Nov. 26, 1877.

4454.—Justice, P. S., Southampton Buildings, London, "A new combined tap and faucet." A communication. Nov. 27, 1877.

4463.—Cullen, P., and M'Kellar, P., Glasgow, "Improvements in service and stop cocks, cranes, or valves." Nov. 27, 1877.

4479.—Aube, P., Toulon, France, "Improvements in the manufacture of gas, and in apparatus used in its production." Nov. 28, 1877.

4530.—Boag, J. D., Hackney, London, "Improvements in the manufacture of gas for illuminating and heating purposes." Nov. 30, 1877.

4536.—Wirth, F., Frankfort-on-the-Maine, Germany, "Improvements in purifying water." A communication. Dec. 1, 1877.

4538.—Benson, M., Southampton Buildings, London, "Improvements in pipe-joints for containing liquids, gases, and air, but more especially applicable to gas and water mains." A communication. Dec. 1, 1877.

4552.—Gent, J. S., Manchester, "Improvements in the manufacture of gas-burners." Dec. 1, 1877.

4555.—Voisin, A., Paris, "Improvements in method or process for lighting gas lamps or burners, and in apparatus employed therefor." Dec. 1, 1877.

4576.—Hilton, M., Prestwich, Lancs, "Improvements in the manufacture of gas." Dec. 3, 1877.

4594.—Platt, J., St. Martin's Lane, London, "A gas-stove with self-acting spring tap." Dec. 4, 1877.

4617.—Galloway, C. J., and Beckwith, J. H., Manchester, "Improvements in pumps for raising or forcing liquids." Dec. 6, 1877.

4622.—Jones, F., Birmingham, "Improvements in apparatus for raising and forcing liquids, for exhausting gas, for blowing air, and for measuring liquids." Dec. 6, 1877.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2085.—Budenberg, A., Manchester, and Hurter, F., Widnes, Lancs, "Improvements in pressure, vacuum, and speed gauges and recorders." Partly a communication. May 29, 1877.

2125.—Smeaton, W. M., Strand, London, "Improved mechanical arrangements for preventing waste and regulating the flow of water, specially useful for water-closets." May 31, 1877.

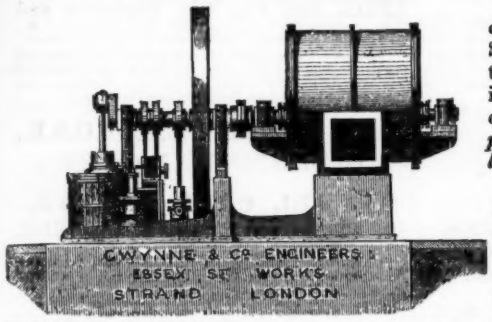
2135.—Parkes, J., Birmingham, "Certain improvements in taps or cocks for steam, water, and other similar purposes." June 1, 1877.

2447.—Puckett, W., Marlborough Street, London, "Improvements in gas apparatus for heating water or other liquids." June 23, 1877.

2488.—Marshall, F. D., Cambridge Street, London, "Improvements in the manufacture of gas, and in apparatus therefor." June 27, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;
Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

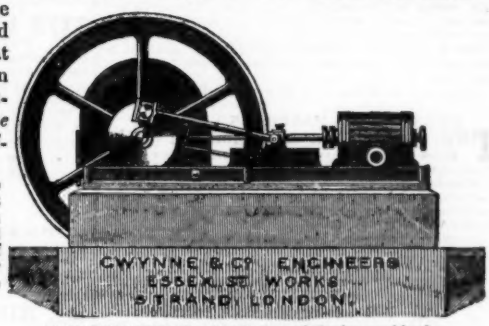
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their M[illegible] chinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

☞ *G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines with many others of all Sizes*

NOTICE OF REMOVAL.

D. BRUCE PEEBLES & CO.

Beg to announce that they have REMOVED to their New Premises,

TAY WORKS, BONNINGTON, EDINBURGH,

To which all communications should now be addressed:
May 30, 1877.

TO GAS-FITTERS.

WANTED, a steady and experienced Workman. None need apply who cannot produce first-rate testimonials as to workmanship and sobriety.
Apply at once to the MANAGER, Gas-Works, DORCHESTER.

WANTED, by the Advertiser, one or more parties to join him in Purchasing and Working Gas-Works, where there is a sure return of 10 per cent. profit on the amount of capital invested.
Apply, by letter only, in first instance, to No. 424, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady, competent Man as Meter Inspector, Gas-Fitter, and Main and Service Layer. One able to do smith's work preferred.
Apply, stating age, wages required, and with testimonials or references, to the MANAGER, Gas-Works, Malton, YORKSHIRE.

WANTED, the Address of Gas Companies who have not received a Copy of the New Edition of PAMPHLET for GAS COMPANIES to distribute to their Gas Consumers—"Cooking and Heating by Gas." Price £6 for first thousand. Copies by post Threepence—direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

WANTED, a respectable man as Gas-FITTER for interior and exterior work. Must be a man of experience, and have a knowledge of service laying. Wages, according to ability, from 24s. to 28s. per week.
Apply, by letter, addressed No. 420, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a situation as Working MANAGER in a small Gas-Works. Thoroughly competent in the manufacture and distribution of gas, main and service laying, &c. Can give eight years character.
Address F. S., 149, Cheltenham Street, Churnet Street, MANCHESTER.

WANTED, Orders for Samples to test the superior Silkstone, Wigan, and other Gas Coals and Cannel on Sale by G. J. EVESON, Gas Coal and Cannel Contractor, BIRMINGHAM.
N.B.—Prices on personal application, or by post or telegram, on shortest notice, and prompt delivery.

WANTED, by a Young Man, the son of a Gas Engineer, a situation as ASSISTANT in a large Gas-Work, or as Manager of a smaller one. Is a good draughtsman, has a knowledge of chemistry, and is quite competent to take charge of a work. Can be well recommended.
Address No. 415, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager wanted for small Works on the Mediterranean. Married man preferable. Must know French. House, &c., on the premises. Must be able to take sole charge. Salary £120 to £160, according to qualifications, which state in writing to GEORGE ANDERSON, 35A, Great George Street, WESTMINSTER.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

ON SALE—One Station-Meter, to pass 1000 cubic feet per hour. Almost new. Will be sold cheap.
Apply to J. HALL, Gas-Works, St. Helen's, LANCS.

ON SALE—Sixty Tons of Carbon from Brick Gas Retorts.
State price per ton at Gas-Works up to 20th of December, to Mr. BRIDGE, Gas Offices, DUKINFIELD.

TO TAR DISTILLERS AND OTHERS.

FOR SALE, with possession on Jan. 1, CHEMICAL WORKS in operation, about 50 miles from London. Modern, well constructed, with best facilities for carriage by water and rail. Plant capable of working upwards of 400,000 gallons of Tar and 250,000 gallons of Liquor per annum. Plant, goodwill, and existing contracts for Tar and Liquor, about £2000.
Principals or their Solicitors only treated with.
Address No. 423, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE,
6000 TONS OF PURE NATURAL
"HYDRATED PEROXIDE OF IRON"
For GAS PURIFICATION.

For price and particulars apply, by letter, to No. 421, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS PLANT FOR SALE, suitable for Small Works:—
Seventeen 4-inch and 3-inch H-Pipes.
Eighteen 15-inch Circular Mouthpieces.
A 6-inch Governor.
A Station-Meter, to pass 6000 cubic feet per hour.
Scrubber and Washer combined; very good.
Vertical Condenser; very good.
Seven 7-feet lengths, 12-inch D-shaped Hydraulic Main.
Two Gasholders, each capable of holding 15,000 cubic feet.
Apply to the ENGINEER, Phœnix Gas Company, GREENWICH.

GAS AND WATER WORKS TO BE LET.

TO BE LET ON LEASE, for a term of years, the Milford Haven Gas and Water Works, Pembrokeshire.
The Works are fitted up with every requisite, and are in full operation.
Possession may be had on the 31st of December next, when the present Lessee's term expires.
Apply to the CLERK of the Milford Improvement Commissioners, Commissioners Offices, MILFORD HAVEN.

MAIN-LAYERS Wanted. Apply, by letter, to No. 425, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Directors of the Whitworth Vale Gas Company invite TENDERS for the supply of the following Turned and Bored GAS-MAINS, viz.:—450 yards of 12-in., 100 yards of 4-in., and 200 yards of 3-in., coated by Dr. Smith's process, and delivered free at the Facit Railway Station.
Particulars as to weights, &c., may be obtained from the undersigned, to whom tenders must be sent, on or before the 18th inst.
EDMUND LORD, Manager, &c.
Whitworth, near Rochdale, Dec. 8, 1877.

BOROUGH OF HALIFAX.

THE Gas-Works Committee invite TENDERS for the supplying and fixing, at the Halifax Gas-Works, of a Gas Scrubber, 60 ft. by 12 ft.
Tenders, accompanied by designs, must be sent to me on or before Thursday, the 27th day of December inst.
For further information apply to Mr. Wm. Carr, Engineer, at the Gas-Works.
By order,
A. C. FOSTER, Town-Clerk.
Town-Hall, Halifax, Dec. 7, 1877.

BOROUGH OF HALIFAX.

THE Gas-Works Committee invite TENDERS for the supply of Fire-Clay RETORTS and BRICKS, during a period of two years, commencing Jan. 1 next.
Forms of tender and further information may be obtained on application to MR. WM. CARR, Manager of the Gas-Works, HALIFAX, and tenders, properly endorsed, must be sent to me on or before Thursday, the 27th day of December inst.
By order,
A. C. FOSTER, Town-Clerk.
Town-Hall, Halifax, Dec. 7, 1877.

NELSON LOCAL BOARD.

TO GASHOLDER MAKERS.

THE Gas Committee are prepared to receive TENDERS for making an 80-ft. Single-Lift GASHOLDER into a Double-Lift GASHOLDER.
Plans and specifications may be seen, and all particulars obtained, on application to the Manager, at his Office.
Sealed tenders, endorsed "Tender for Gasholder," must be sent to the undersigned, on or before the 27th day of December.
WILLIAM FOSTER, Manager.
Gas-Works, Nelson, Lancashire, Dec. 5, 1877.

BAHIA GAS COMPANY, LIMITED.
POSTPONEMENT OF THE
EXTRAORDINARY GENERAL MEETING,
From Dec. 11 to Dec. 18, 1877.
NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of this Company will be held at the Company's Office, 10, Coleman Street, London, on TUESDAY, the 18th day of December, 1877, at Three o'clock, for the purposes previously stated.
By order of the Board,
ALFRED J. HEAD, Secretary.
10, Coleman Street, London, E.C., Dec. 6, 1877.

BOROUGH GAS-WORKS, WIGAN.

GAS PLANT FOR SALE, as follows:—

One Vertical Double-action EXHAUSTER, by Baker and Valliant; capacity 40,000 ft. per hour. Only been in use six years.

One Vertical Double-action EXHAUSTER, by Musgove; capacity 23,000 ft. per hour.

Two Single-flued BOILERS, 16 ft. long by 5 ft. diameter, with valves and steam-pipes complete. These Boilers have very recently undergone thorough repair, and have been working at a pressure of 50 lbs. to the square inch.

Also a quantity of RETORT-FITTINGS, all equal to new, but have been replaced by others of larger dimensions. The lot will be sold cheap.

Apply to J. G. HAWKINS, Engineer, Gas-Works, WIGAN.

TO GASHOLDER MAKERS AND OTHERS.

THE Gas and Water Committee of the Heywood Local Board invite TENDERS for the construction and erection of a Telescope GASHOLDER, 100 ft. in diameter.

Drawings and specifications may be seen, and further particulars obtained, on application to Mr. Edwin Buckley, Engineer, Gas-Works, Heywood.

Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Gasholder," not later than Saturday, the 22nd inst.

The Committee do not bind themselves to accept the lowest or any tender.

JNO. BANKS, Clerk to the Local Board.

Office of Local Board, Heywood,
Dec. 11, 1877.

GAS PLANT AND 15-TON HAND CRANE FOR SALE.

THE Trustees for the District and Har- bour of Maryport have FOR SALE the following ARTICLES, lately used at the old Gas-Works, which were recently purchased by the Trustees, namely—

D-shaped Hydraulic Main, 1 ft. 6 in. by 1 ft. 6 in.

Fourteen 6-in. Ascension Pipes, with arch pipes all complete.

Fourteen Mouthpieces, 23 in. by 15 in.

Four Doors and Frames.

One Set of Condensers, 36 pipes, 7-in. inlet and 7-in. outlet.

One 4000-light Meter (makers, W. & B. Cowan, Edinburgh) with 6-in. connecting bye-pass valves, gauge, clock, and tell-tale, all in good order, equal to new.

Two Governors, 6-in. inlet and 6-in. outlet, all complete.

And also a 15-ton Hand Crane complete.

Offers to be sent to the undersigned on or before the 29th of December next.

JOHN BARWISE, Clerk to the Trustees.

Harbour Office, Maryport,
Nov. 21, 1877.

MICHAEL & WILL'S GAS AND WATER SUPPLY.

This day is published, second edition, 8vo., 25s., cloth,

THE LAW RELATING TO GAS AND WATER: comprising the Rights and Duties, as well of Local Authorities as of Private Companies, in regard thereto, and including all Legislation to the close of the last Session of Parliament. Second Edition. By W. H. MICHAEL and J. SHIRESS WILL, of the Middle Temple, Esqs., Barristers-at-Law.

London: BUTTERWORTHS, 7, FLEET STREET, Her Majesty's Law Publishers.

NOW READY,
THE
GAS COMPANIES
EXPENDITURE JOURNAL,

Being a Ruled Account-Book with Printed Headings, and Analysing Guide for Keeping, upon the easiest and most correct method, the Expenditure of a Gas Company, in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

Prices, half bound, cloth sides, 2 quires, 30s.; 3 quires, 36s.; other sizes and bindings to order.

Published by EDWARD SANDELL, Accountant, 4, Skinner's Place, Size Lane, QUEEN VICTORIA STREET, and W. B. KING, Office of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, E.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

ALFRED LASS,
SPECIAL ACCOUNTANT FOR GAS COMPANIES,
30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by A. L. to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

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BOUCK & CO., LIMITED,
TAR DISTILLERS & MANUFACTURING CHEMISTS,
MILES PLATTING, MANCHESTER.

BUYERS OF COAL TAR,
And Crude Products therefrom,
AMMONIACAL LIQUOR, &c.

PARIS EXHIBITION, 1878.

MM. SERVIER, MONNIER, ROUGET, Engineers, specially in connection with the industry of Gas Lighting, will undertake to represent any Manufacturers who may be Exhibiting Goods in Classes 27 and 53.

References in France and England.

OFFICE: 18, RUE DE MAUBEUGE, PARIS.

TO GAS COMPANIES.

WE beg to call attention to our Im- PROVED STREET-LAMP REGULATORS with brass cones and burners. Sample, 3s.; carriage paid. Special Steatite Burners for Street-Lamps, 8s. per gross. Quotations for quantities. Street-Lamp Regulators, Wet and Dry Meters repaired.

Messrs. TINDALL AND TELLING, Gas Apparatus Works, 74, Wynford Road, Penton Street, LONDON, N.

HENRY LYON,
ENGINEER,
AND
CONSULTING GAS ENGINEER,
BARTON HOUSE, opposite BARTON ARCADE, DEANSGATE, MANCHESTER.

Mr. ROBERT DEMPSTER, Sen.,
CONSULTING GAS ENGINEER,
Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,
ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

REMOVAL.

CHARLES HEISCH, F.C.S., Analytical and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has REMOVED from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

TO GAS ENGINEERS, MANAGERS, &c.

HILL and CO., Gas Engineers and Architects, 11, Appach Road, BRIXTON RISE, S.W., prepare Designs for the construction of New Gas-Works, Bridges, and Roofs, or for the remodelling and extension of existing Works. Also provide Drawings of all kinds of Gas Apparatus and Plant. Drawings, Tracings, and Specifications copied for Engineers and Contractors.

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

Now ready, price One Shilling, No. 13 (to be continued Monthly) of

A TREATISE ON THE SCIENCE & PRACTICE
OF THE
Manufacture and Distribution
OF
COAL GAS.

LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET,
OR OF ANY BOOKSELLER IN TOWN OR COUNTRY.

For the convenience of persons resident in remote districts, arrangements have been made by the Publisher to forward the "Treatise" by Post, securely packed, at the cost of 1s. 2d. Monthly, or 7s. for the Half Year.

NOTICE.

THE GAS & WATER COMPANIES DIRECTORY,
1878.
(WATER SECTION.)

The Editor will feel greatly obliged if Secretaries and Engineers would fill up, and return to him at once, the forms sent them, as the work is now going to press. If any have not received Forms, they will be forwarded immediately, on application to the Editor,

CHARLES W. HASTINGS,
8, BUCKINGHAM STREET, ADELPHI, LONDON, W.C.

E. & W. H. HALEY,
General Ironfounders and Makers
OF
CAST-IRON GAS AND WATER PIPES.
Sizes 1¼ to 15 inches.

LISTER HILLS FOUNDRY, BRADFORD, YORKSHIRE.

J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
IRONFOUNDERS AND CONTRACTORS,
GOWTS BRIDGE WORKS,
LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

ECONOMY IN THE PRODUCTION OF GAS.

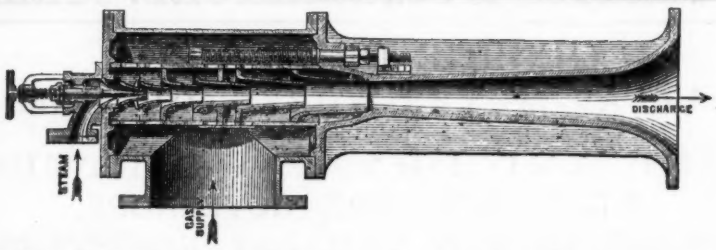
PLUTONIC CEMENT,

For Jointing and Repairing Retorts and Ovens *in* action and *out* of action.

A Pamphlet on the advantages of the above, with modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer,

CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 250 IN USE.

CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

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OR TO

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

J. & J. BRADDOCK,

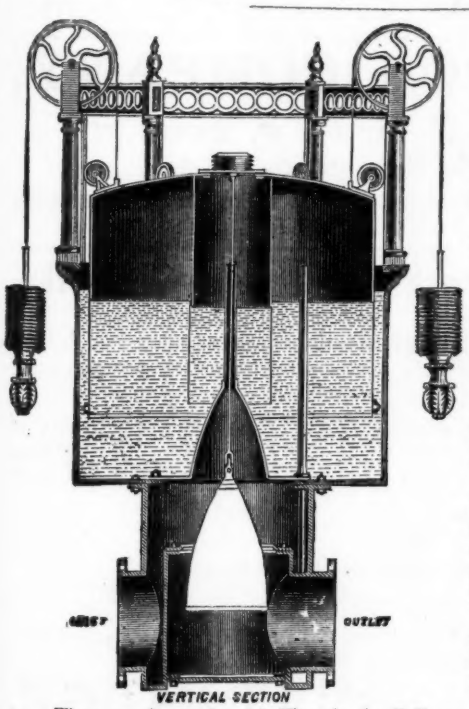
GLOBE METER-WORKS,

OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

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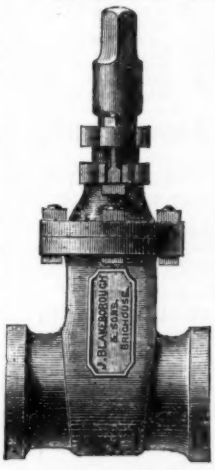
SLUICE VALVES.

The STRONGEST, CHEAPEST, & BEST in the TRADE.

HYDRANTS.

The Largest Variety of Improved Designs in the Market.



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SLUICE VALVES for Water.
DO. for Gas and Sewage, 1½ to 48 in.
RESERVOIR SLUICES
AIR VALVES.
REFLUX VALVES.
BALL VALVES.
Compound HYDRANTS.
Straight-way Do.
Screw-down Do.
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STAND POSTS, various.
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Tested with 600 to 1000 feet head of pressure.

J. BLAKEBOROUGH & SONS,

Commercial Brass and Iron Works, } BRIGHOUSE,
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WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

W T I P
TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

CATHELS'S Patent Gas-Washer is an excellent cleanser of gas from tar, ammonia, sulphur, and carbonic acid, reducing the cost of subsequent purification 30 to 50 per cent. Needs no motive power or attention beyond drawing off and recharging as required. Has no moving parts or complications to get out of order. Is of moderate cost, and is practically indestructible.
Application to be made to the MANUFACTURERS, the Horseley Company, Tipton, STAFFORDSHIRE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,
SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.
Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

THOMAS LAMBERT & SONS
MANUFACTURE EVERY DESCRIPTION OF
GAS AND WATER FITTINGS;
ALSO,
WROUGHT-IRON TUBES & FITTINGS.
SHORT STREET, LAMBETH, LONDON.

BELGIAN CLAY RETORTS.
J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE
FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY,
and every Article suitable for
GAS AND WATER WORKS.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

PATENT HYDRAULIC LIFTS, CRANES, HOISTS,
Suitable for Lifting Purifier-Covers, &c.
S. CLAYTON & CO., BRADFORD, YORKS.

GEORGE ORME & CO.,
ATLAS METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
STATION-METERS, GOVERNORS,
PRESSURE AND EXHAUST REGISTERS,
LAMP-METERS IN CAST-IRON BOXES,
And every Description of Gas Apparatus.

MOORE'S PATENT DIP-PIPE.

THE advantages of this Dip will be seen from the engraving. It is thoroughly effectual in its working, removing the whole of the pressure of the hydraulic main from the retort, thus causing a great saving in gas. It is very easy of manipulation, requiring little care and attention; it cannot get out of order, and, when shut, works as an ordinary Dip-Pipe. No accumulation of carbon in retort. Can be fixed to existing H-pipes.
In ordering the Dip, the distance from top side of hydraulic main to water-level should be stated; also the Dip at which it is required to work when the valve is shut.

PRICES—3-in., 35s.; 4-in., 42s.; 5-in., 48s.

SOLE AGENT: J. GILL, GAS-WORKS, BRIDGENORTH,
To whom all communications should be addressed.
MAKERS: THE COALBROOKDALE COMPANY, SHROPSHIRE.

THE WIGAN COAL & IRON COMPANY,
LIMITED.
DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;
Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.
N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

To Directors of Gas Companies, Gas Engineers, and Managers of Gas-Works.

GENTLEMEN,—We beg to remind you that this is the time when all orders of any magnitude for Fire-Clay Gas-Retorts, and all kinds of Fire-Clay Goods likely to be required during next season, should be given out.
In reply to some reports that have been raised respecting our firm, we take this opportunity of saying that we have been established as the largest makers in the trade for over thirty years; that we are now in a better position than ever to supply our customers; and that, for quality of material, workmanship, and endurance, our goods are equal or superior to any that are produced.
Soliciting your favours,
We are, Gentlemen, your obedient Servants,
HARRIS & PEARSON.

Illustrated Catalogues and Price Lists, or Special Quotation (on receipt of specification), sent free to any part of the World. Also Quotations for Cast-Iron Pipes, Wrought-Iron and Lead Tubing. Address—
HARRIS & PEARSON, STOURBRIDGE.

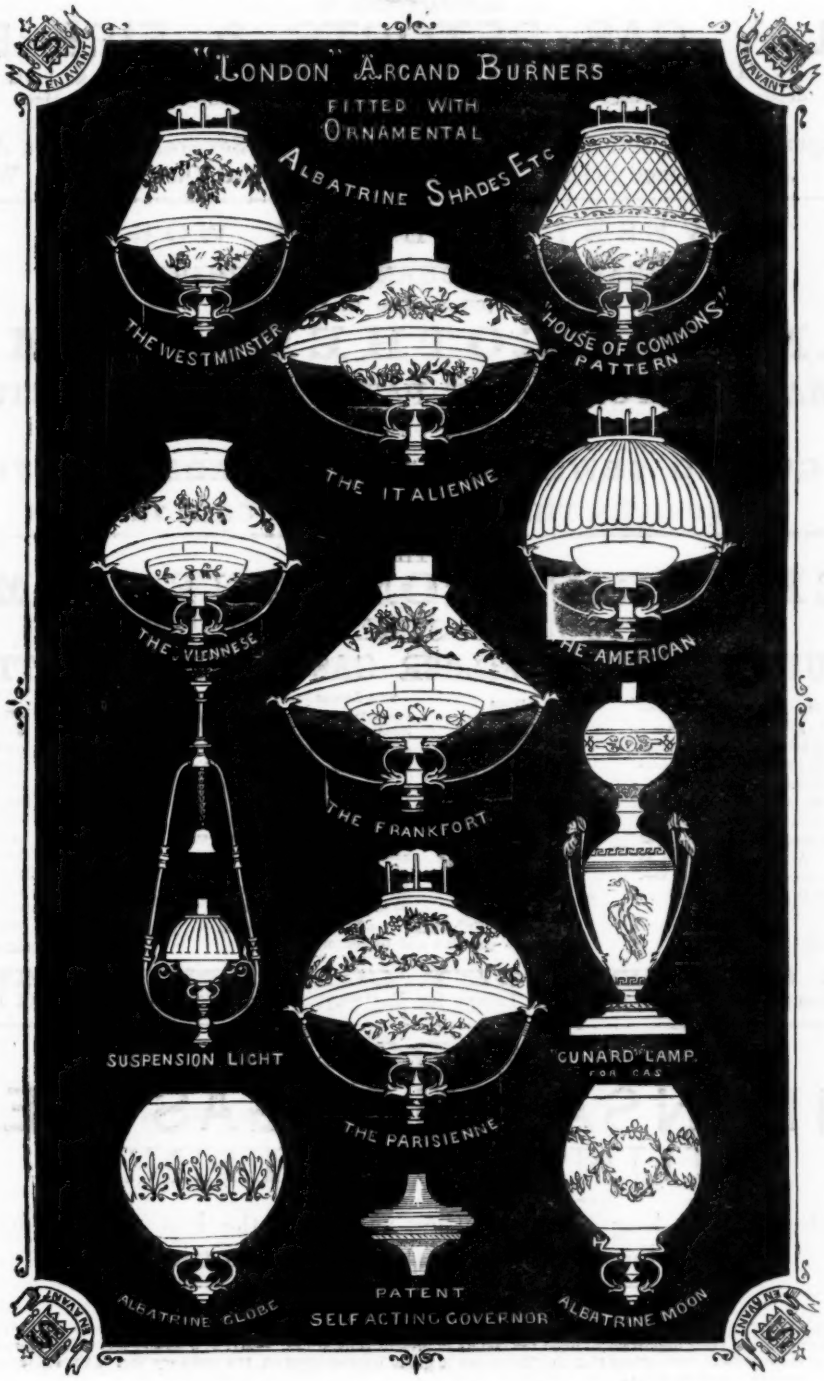
WILLIAM SUGG'S PATENT GAS BURNERS.

PARIS, 1867. LONDON, 1862.

"The Patent 'London' Argand Burner is adopted by the Gas Referees as the Standard Burner for London."—*Vide Gas Referees Report, May* 3, 1869.

"The very best Burner yet constructed."—*Vide Gas Referees Reports*, 1869 and 1871.

There are now Eleven Sizes of these Burners, Nos. A to H, J, K, and N, giving a light from 8 to 45 Candles, according to size.



The Patent "Christiania" Self-regulating Flat-flame Burner, fitted with Albatrine Globular Shade, gives a light equal to three ordinary Fishtails.

The Registered "City" Screw-regulating Flat-flame Burner is the best for Open Lights—Warehouses, Railways, Kitchens, Passages, &c.

The above Shades may also be had in Plain White Albatrine.

PRICE LISTS AND PARTICULARS MAY BE HAD POST FREE OF THE MANUFACTURER & PATENTEE,

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT ST., WESTMINSTER, S.W.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. G. WARREN DRESSER, Editor.

Issued Semi-Monthly at No. 42 Pine Street, New York City.

This Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

London Agent for Gas-Retorts: D. W. OGG, 3, Jeffrey's Square, St. Mary's Axe, E.C.

" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.

(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS

THE

SILBER LIGHT COMPANY, LIMITED,

49, WHITECROSS STREET, LONDON, E.C.

MANUFACTURERS OF SILBER GAS-BURNERS & FITTINGS.

No. 285.

The Times says: "A considerable improvement upon any burners of the same kind that have hitherto been constructed."

Dr. W. WALLACE, F.R.S.E., F.C.S., says: "After a careful study of the principles of the Argand, I have come to the conclusion that your burner is the best at present known."

The Silber Tubulated Gas-Burner.

No. 291.

The *Lancet* says: "Mr. Silber has obtained a light of singular steadiness, whiteness, and illuminating power, with the great additional advantage of such perfect combustion as to preserve the purity of the atmosphere."

The manager of the gas-works at Southport says: "When our gas is 18 candles with the Standard burner, the Silber gives it as 22. You ought to get it noticed by the gas managers at once."

The Silber Tubulated Gas-Burner, with Opal Shade and Cup and Governor attached.

No. 286.

The Times says: "Besides the Argand burners, some improved Bat's-wing burners of different sizes were exhibited. In these there is an internal chamber permitting the expansion of the gas before it reaches the flame. They are constructed to burn from two to eight cubic feet of gas per hour, and the illumination they give ranges from 4 to 30 candles, a considerable improvement upon any burners of the same kind that have hitherto been constructed."

The Silber Bat's-wing Gas-Burner

THE SILBER LIGHT COMPANY, LIMITED,

Are also Manufacturers of every description of Lamps for Railways, Ships, Streets, Churches, and Domestic Purposes.

IMPROVED COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS AND WATER WORKS, GENERAL ENGINEERS,

IRONFOUNDERS, AND MANUFACTURERS

OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS,

AND

GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire Erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the Supplying and Laying of MAINS.

They make a speciality of supplying every requisite whatever for a Gas-Work, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

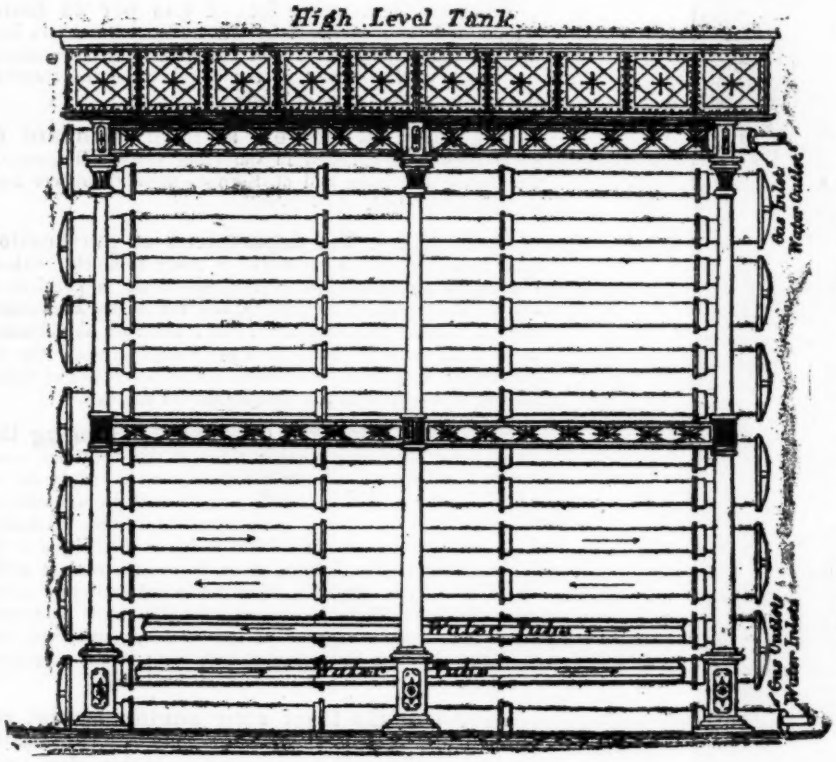
MANUFACTURERS OF

MORRIS & CUTLER'S PATENT CONDENSER

AND

CUTLER'S PATENT GAS-WASHER.

(For Illustration and Description, see "Journal" for Nov. 27, page 848.)



Description of Morris & Cutler's Patent Condenser.

The Condenser may consist of pipes arranged in tiers as shown, or in any other form most convenient to the site available, each tier being connected with special connexions, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. (The Condenser itself may form the support for a high-level cistern as illustrated.) By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control.

The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to

Mr. F. MORRIS, GAS-WORKS, BRENTFORD,

OR TO

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), **LONDON, E.**

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

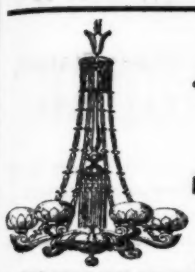
They contain their own engine power, re-quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,
148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,
SOLE AGENT FOR
THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,
35A, GREAT GEORGE STREET,
WESTMINSTER, S.W.,
PATENTEE and MANUFACTURER of the following Inventions:—
RETORT SETTINGS—giving great Economy of Fuel.
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.
FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

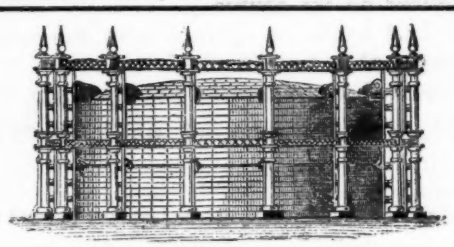
PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GAS PURIFICATION.

BAILES & HALLSWORTH,
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS,
BY THEIR
PATENT OXIDE OF IRON COMPOUND.

The material is in use at most of the principal Gas-Works in Yorkshire and elsewhere. It contains considerably less moisture than natural Oxide of Iron. It is much cheaper and more efficient as a purifying agent.
B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.
FOR SAMPLES AND TERMS, ADDRESS—
BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY, LEEDS.

HOPE IRON WORKS,



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ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

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CANNEL COAL MERCHANT,
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SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL
Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL
Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL
Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET, EDINBURGH.
Established 1840.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

ADDISON POTTER,

WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

CLOTH GAS-BAGS FOR MAINS.

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,
107, GOSWELL ROAD, LONDON, E.C.

GRIRDROD'S PATENT
PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.
In use at the chief gas-works, and giving great satisfaction.
For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,
Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

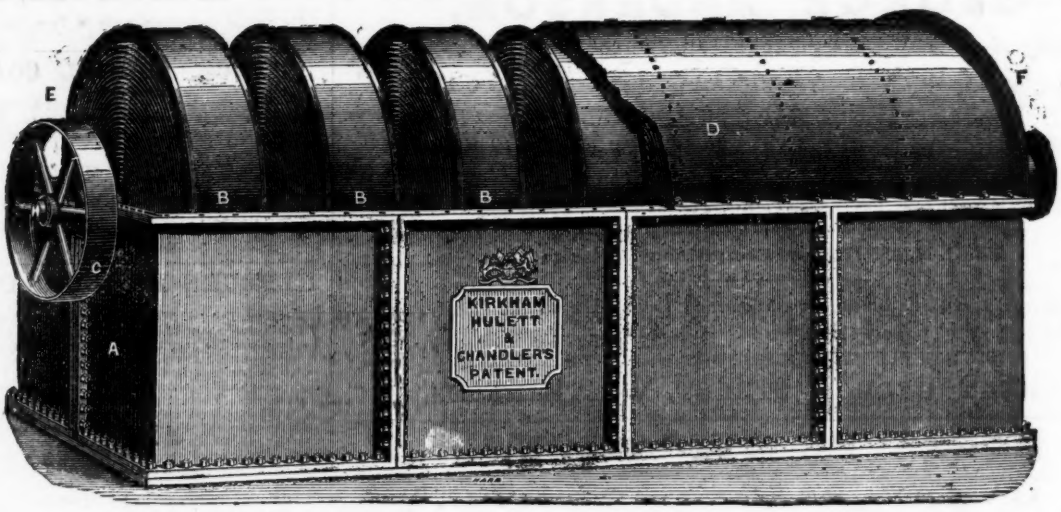
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

STANDARD WASHER AND SCRUBBER.



The advantages of the Apparatus will doubtless be understood by those interested in gas manufacture.

The principal points of any Apparatus for the extraction of ammonia may be summarily stated as follows:—

1. **A large amount of Surface is desirable.**
2. **Such Surface should be always effectually Wetted.**
3. **The Surfaces or Scrubbing Material should cause no Pressure.**
4. **The Gas should meet various strength Liquors on its course.**
5. **However small the quantity of Water used, it ought to operate over the whole Surface.**
6. **Changing Scrubbing Material is both Objectionable and Expensive.**
7. **Economy both as to Space occupied and Cost of Apparatus is an important item.**

All these requisitions are supplied by the above Apparatus, of which the following is an explanation:—

A is a cast-iron tank, formed into several separate water-tight compartments.

B B B volutes of sheet iron fitted to the centre shaft, which is driven by the pulley, C, and causing the said volutes to revolve each in a separate compartment filled with water or other fluid.

D, the cover, has partitions fitted into it corresponding with those in the tank, sufficient space being left between the top of the partition in the tank and the lower edge of that in the cover, to allow the gas a free passage through the first volute to the second, and so on to the third, fourth, &c.

The action is as follows:—The crude gas entering at E is partly washed in the first compartment, which becomes 10 or 12 oz. liquor, or stronger if required, according to the quantity allowed to enter per ton; the gas then passes to the second, where the liquor is of a less strength; thence into a weaker liquor, as it passes from one compartment to the other, finishing at the last compartment or outlet, F, with clean water, which is constantly flowing and running over from one compartment to another, until it reaches the last space, from which it flows from the outlet-pipe into the well or tank ready for sale or removal.

Taps are inserted in each compartment for the convenience of drawing liquor for testing, &c.

Applications as to Cost, &c., may be obtained of either

Mr. D. HULETT, 55 & 56, HIGH HOLBORN;

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER;

Or Messrs. CHANDLER, 104, NEWINGTON CAUSEWAY.

Inquirers will please state their Maximum Day Make.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

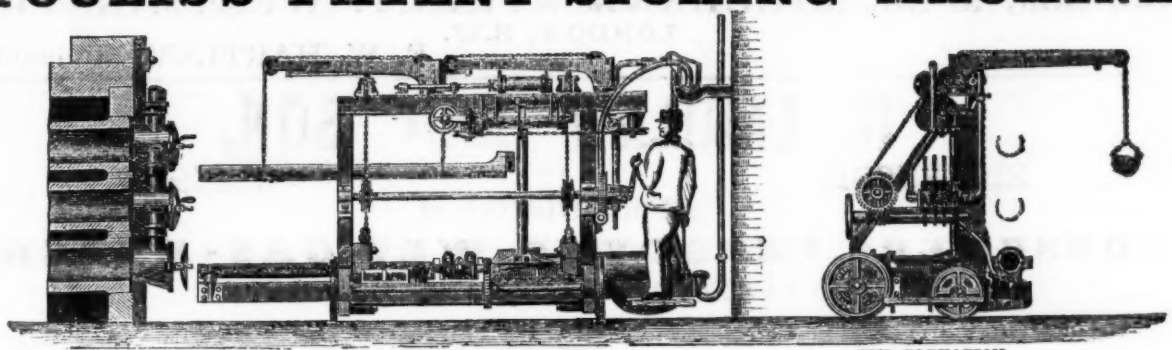
Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF CHARGING MACHINE. END ELEVATION

(*The Drawing Machine will be Illustrated in next week's Advertisement.*)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz;
Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

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